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EDITORIAL

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There is a particular kind of optimism that runs through this issue of the Educational Advancement and Development Journal, the optimism of researchers who refuse to treat "development" as an abstraction. Across twenty-seven articles, drawn from classrooms in Lagos and Abia, farms in Adamawa and Cross River, fish ponds in Bayelsa and libraries serving adult learners across Nigeria, our contributors keep asking the same underlying question in different registers: what does it actually take to move a system forward, not just talk about moving it forward? The answers they offer, read side by side, tell a richer story than any single paper could tell alone.

Technology has arrived in African classrooms: the question is on whose terms.

Read together, Agwi and Law-Obi's examination of Artificial Intelligence in Technical and Vocational Education and Training (p. 40) and Imakpokpomwan and Obidaju's treatment of blockchain in education management systems (p. 50) are less about two different technologies than about one shared anxiety: that Africa risks importing tools faster than it builds the capacity to use them well. Eke and Ede's study of intelligent tutoring systems among economics educators (p. 69) and Ugwunali and colleagues' work on e-learning platforms for trade skills instruction (p. 117) push the same point further into practice, showing that adoption is uneven, that infrastructure gaps persist, and that teacher readiness, not software, is usually the binding constraint. Taslim, Ugwunali and Okorieocha's piece on digital technologies in industrial education (p. 141) and Mohammed, Onu and Asogwa's analysis of ICT competencies among agricultural educators (p. 198) close the loop by asking what happens after the technology is procured: whether the people meant to use it were ever trained to. Nwankwo, Ibiam and Igwebuike's correlational study linking teachers' digital competencies to students' learning outcomes in South-East Nigeria (p. 207) supplies the empirical punchline the other papers gesture toward: competency, not access, is what moves the needle on outcomes. Taken as a set, these six articles form an implicit policy brief: invest in people before platforms.

Access and equity remain the quieter, harder problem.

Where the technology cluster asks how we teach, a second cluster asks who gets taught at all. Ayanwole, Bamgbowu and Kelani's work on vocational access, youth employment and income generation (p. 58) sits naturally beside Dike and Ngerem's study of the Sustainable Development Goals and community participation in Universal Basic Education (p. 132). Both papers treat education not as a credential but as a lever for economic and civic inclusion. Oviri and Omwanghe's contribution on libraries bridging the generational divide in adult digital literacy (p. 150) extends that lever into a population too rarely discussed in African education research: adults who were failed by, or excluded from, earlier schooling. It is worth noticing that this cluster and the technology cluster above are, in fact, one conversation split in two, namely that digital tools mean little if the community participation, funding and institutional will described here are absent.

The rural economy is an education story too.

A striking feature of this issue is how much education takes place outside the classroom altogether. Mombom, Wombo and Ekele's research on agricultural waste and degraded land

productivity in Cross River (p. 161) and Yaro, Ngbongha and Shimava's study of farm management training needs among Adamawa's agricultural science teachers (p. 169) both insist that agricultural extension and agricultural pedagogy cannot be separated: one cannot teach farming well if the land itself is failing and one cannot fix the land without teachers equipped to teach the fix. Magnus and Asogwa's competency-needs study on cucumber production (p. 79), Osemene's work on motivating indigenous fish farmers toward greater protein production in Bayelsa (p. 185), and Chukwuma and Ede's research on financial literacy for rural communities in Ikwuano (p. 92) complete a quietly powerful argument: rural livelihoods, food security and household finance are not adjacent to the education mandate. They are the education mandate for the majority of the population this journal ultimately serves.

And beneath all of it, the human being in the system.

Two papers ground the volume in something more basic and intimate. Iberedem and Udofia's post hoc analysis of WASSCE mathematics performance in Lagos (p. 1) is a reminder that our biggest technological and policy ambitions still rest on whether a teenager can solve a multiple-choice item under exam conditions, and that better diagnostic tools, not just better curricula, help us understand why some do and some do not. Ataha and Amu's study of panic attacks among secondary school students in Edo State (p. 19) is, in some ways, this issue's conscience: a reminder that the learner arriving in an AI-enhanced, digitally competent, well-resourced classroom is still, first, a young person managing anxiety, pressure and sometimes even full-on crisis. No amount of infrastructure investment substitutes for attention to student well-being. Onyenweaku, Ibiam and Ike's work on administrative quality assurance and teacher evaluation in Abia's public secondary schools (p. 176) reminds us that the adults responsible for that attention need evaluation systems that actually support them, not merely audit them. Odo's assessment of biology teaching and learning strategies in Ikwuano (p. 29) belongs here too as it is a study of the ordinary, daily craft of good teaching that makes every other ambition in this issue possible.

Finally, Okwori's comparative analysis of the United Nations and the implementation of international human rights standards (p. 8) and Abdulkareem and colleagues' study of remote sensing and GIS technologies for environmental sustainability in South-West Nigeria (p. 106) remind us that educational research does not stop at the school gate. Right frameworks and environmental monitoring are the macro-scaffolding within which every classroom, farm and library in this issue operates.

If there is a single thread worth pulling from Volume 2, Number 1, it is this: African education research is done being asked to justify its own existence. It is instead doing the harder, more interesting work of connecting technology to teacher capacity, access to community participation, agriculture to pedagogy and student wellbeing to institutional design. We are grateful to our twenty-five contributing teams, our diligent reviewers and our readers across the continent and beyond for making that connective work visible.

We commend this issue to you, and we invite you to read it not article by article, but as the conversation it truly is.

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30 June 2026

About the Journal

Educational Advancement and Development Journal (EADJ) is a scholarly publication by NEAD Africa, an organisation focused on advancing academic and professional discourse in various fields relevant to the African continent. The journal aims to provide a platform for researchers, academics, and professionals to publish their findings, share insights, and discuss emerging trends and challenges within their areas of expertise.

The seeds of Network for Educational Advancement and Development were planted by Dr. Vincent Chidindu Asogwa during the International Conference on Advancing the Continent of Africa through Research organized by National Association of African-American Studies and held at the University of South Africa, Pretoria between July 23rd and 25th 2023. His attendance to the conference was sponsored by the University of Eswatini, Eswatini, where he realized that Africa has barely 1% of the world's global research output and, on average, contributes about 0.4% of its GDP to research and development. It was agreed by the inaugural group that there is lack of research on Africa made by African researchers; hence the need to strengthen research capacities and North-South partnerships.

In particular, the network serves as a meeting and communication forum for all its subscribers resident in Africa and elsewhere. It is a network for exchange of knowledge on an international level and constitutes machinery allowing for a better dissemination of information on research, teaching and outreach. The network also aims at the development of relations with all other professional and research-oriented networks that are active in the field of economics, management and development.

Dr. Maxwell Okwudili Ede
Managing Editor
Educational Advancement and Development Journal (EADJ)

Note to Contributors

1. The *Educational Advancement and Development Journal (EADJ)* is a scholarly and trans-disciplinary research publication. Manuscripts to be considered for publication must be found very useful to both scholars and practitioners in Africa, Education and related fields.
2. Articles which should be typed in double spacing should not exceed 20 quarto pages including references and abstracts using Microsoft Word format.
3. The title and institutional affiliation of the author(s) and an abstract of not more than 250 words should precede the title.
4. Manuscript under consideration by other journals must not be submitted.
5. Empirical reports must be written under the following distinctive headings:
   i. Introduction should incorporate background of study, statement of problem, Purposes/Objectives/ Research Questions/Hypotheses.
   ii. Significance of the study and appropriate literature.
   iii. Methodology - This should contain the following distinctive sub-headings: Area of study, paradigm, approach, method, design of the study, population, sample, instrument, data collection, and analysis techniques.
   iv. Findings.
   v. Discussion.
   vi. Conclusion.
   vii. References.
6. Non-empirical reports must have:
   i. Introduction - that shows clearly the focus of the article.
   ii. Main body - under distinctive headings that could have been reflected in the Introduction.
   iii. Conclusion with appropriate recommendations where necessary.
   iv. References.
7. Literature must be relevant, rich and current. References should be according to the American Psychological Association (APA) latest edition.
8. Tables must be in line with the MS Word table format.

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Use of Post Hoc Analysis in Determination of Students' Performance in 2023-2025 Mathematics WASSCE Multiple Choice Test in Lagos State, Nigeria

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Abstract

Post-Hoc analysis is undertaken when a tested hypothesis is rejected and there is further need to identify the variable that is responsible for the difference. The study investigated use of Post-Hoc analysis in determination of Students' Academic Performance in 2023-2025 Mathematics WASSCE in Ojo LGA, Lagos State as three null hypotheses were formulated for this study. It employed survey research design using the descriptive approach as population comprised Senior Secondary School III Students who sat for the 2023-2025 WASSCE. Multi-staged sampling procedure was employed in selection of sample. First, simple random sampling adopting ballot and hat method was used to select Ojo LGA; then, inclusive method was employed to select 30 public secondary schools. Thirdly, proportionate sampling procedure using 50% was introduced to select 15 students each from the 30 schools to form a sample of 450 students. The 2023-2025 Mathematics WASSCE Tests was used for data collection.. Content and construct validity was established by the examination body itself in the course of validating the items. Test retest form of reliability yielded an index of .895(2023), .790(2024) and .861(2025) respectively. Analysis of Variance (ANOVA) and Post-Hoc statistics were used to analyse data with the use of LISREL software and all hypotheses tested at .05 level of significance. The study revealed Post-Hoc analysis was useful only in 2025 Mathematics test alone. It concluded that the difference in 2025 Mathematics Test was attributed to ability of test takers, latent traits and interest level of male students. It recommended that female students need to be encouraged and motivated to build careers around Mathematics- related subjects.

Keywords: Post-Hoc Analysis, Students, Performance, Multiple Choice Test, West African Senior Secondary School Certificate Examination.

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INTRODUCTION

In Nigeria's educational system, Mathematics as a subject occupies a central position in her secondary school curriculum due to its significance to scientific advancement, technological development and improvement in socio-economic growth and development. Just like any other compulsory subject. Mathematics remains one of the core subjects written in the West African Senior School Certificate Examination (WASSCE) conducted by the West African Examinations Council (WAEC). Students' performance in Mathematics is often used as a key indicator of academic competence and readiness for higher education. Research indicates that students' achievement in Mathematics at the secondary school level significantly predicts subsequent academic performance in tertiary institutions, thereby underscoring the importance of accurate and robust assessment practices (Fehintola, 2019).

In large-scale assessments, the examination bodies in Nigeria like West African Examination Council, National Examination Council etc, adopts the use of an achievement test as an objective for measuring students' performance. The scores from the examinations

determine the level of students' academic achievement, which are useful for decision making, certification, selection, prediction, research and development, promotion, experimental process among others. According to examiners report, the West Africa Examination Council revealed the record of students performance between 2023-2025 where 37.9% failure rate was recorded in 2023, 27.8% in 2024 and 36.2% in 2025 respectively. The unstable trend remains a concern for teachers, students, test developers, psychometricians, examination bodies and other relevant stakeholders.

The persistent fluctuations and not too seemingly accepted performance in Mathematics public examinations can be widely attributed to several factors, including teaching methods, teacher quality and learning environments, latent ability, gender disparity, difficulty level of items, among others (Olawoyin & Isuku, 2019; Oribhabor, 2020). Studies employing experimental and quasi-experimental designs in Nigeria have demonstrated significant differences in students achievement across instructional approaches, often identified through inferential statistics (Sunday et al., 2020). These underlined factors that prompt variation in students' performance necessitate more rigorous analytical approaches that go beyond descriptive statistics to uncover significant differences among groups, schools or instructional strategies. As a result, the application of inferential statistical techniques, particularly post hoc statistics, becomes critical in educational research and evaluation. Without Post-Hoc analysis studies may fail to clearly specify or identify the group or groups that contributes towards the significant difference as a result limiting the extent of indepth investigation and interpretation.

The concept of Post-hoc statistical analysis is one of the advanced analytical tool used after an initial analysis of variance (ANOVA) to identify specific group differences responsible for statistically significant results. Post-Hoc procedure is employed in order to conduct pairwise comparison while controlling for type 1 error inflation. They help control error rates associated with multiple comparisons and provide more precise interpretations of academic performance data. In educational studies, post hoc tests such as Tukey, Scheffé and Student Newman Keuls (SNK) are commonly applied to determine where significant differences lie among student groups or instructional conditions. Samaru, et al (2022) stated that appropriate selection of post hoc methods enhances the reliability of findings by minimizing comparison wise and experiment wise error rates, thereby improving decision making in educational research.

Given the increasing emphasis on data-driven educational policy and accountability, the use of post hoc statistics in analysing WASSCE Mathematics performance is both timely and necessary. It provides a more nuanced understanding of students' achievement patterns and supports evidence-based interventions aimed at improving learning outcomes. Therefore, this study examined the use of post hoc analysis in determining students' performance in the 2023-2025 Mathematics WASSCE Multiple Choice Test in Ojo, LGA, Lagos State with a view to enhancing the precision and validity of the scale.

Statement of the Problem

The 2025 Examination cycle of West African Senior Secondary School Certificate especially with respect to Mathematics, a required subject for students to sit for has generated a mixed reaction as stakeholders in the field of education admitted to been disappointed in the performance of students due to the not too seemingly acceptance in performance rate in the state. This unstable performance rate may be associated to poor mastery level, difficulty and discrimination of items, time allocated, gender disparity, environmental and socio-economic factors among others.

Despite numerous interventions targeted at improving instructional quality and learning outcomes, persistent fluctuations in performance levels suggest underlying analytical and evaluative lacuna on how performance information are interpreted and utilised. With over reliant on descriptive statistics of mean and percentage rates which may likely not captured the complexity and variability inherent in examination result, the use of Higher Order Component (HOC) statistics offer a more sophisticated analytical framework capable of providing deeper insights into students' performance patterns.

Research revealed that there is insufficient application and integration of Post-Hoc statistical methods in determining and interpreting students' performance in standardised examinations, hence the study investigated the Use of Post-Hoc analysis in determination of Students' Performance in 2023-2025 Mathematics West African Senior Secondary School Certificate Multiple Choice Test in Lagos State.

Purpose of the study

The main purpose of this study was to explore the use of Post-Hoc Analysis in Determination of Student' Academic Performance in 2023-2025 Mathematics Senior Secondary Certificate Examination Multiple Choice Test in Ojo LGA of Lagos State. Specifically, the study was out to:

1. determine the academic performance of students in 2023 Mathematics Senior Secondary Certificate Examination Multiple Choice Test by gender.

2. determine the academic performance of students in 2024 Mathematics Senior Secondary Certificate Examination Multiple Choice Test by gender.

3. determine the academic performance of students in 2025 Mathematics Senior Secondary Certificate Examination Multiple Choice Test by gender.

Research Questions

The study provided answers to two questions posed by this study and they included:

1. What is the difference in the academic performance of students in 2023 Mathematics Senior Secondary Certificate Examination Multiple Choice Test by gender?

2. What is the difference in the academic performance of students in 2024 Mathematics Senior Secondary Certificate Examination Multiple Choice Test by gender?

3. What is the difference in the academic performance of students in 2025 Mathematics Senior Secondary Certificate Examination Multiple Choice Test by gender?

Hypotheses

Two null hypotheses were formulated and tested at .05 level of significance:

$H0_1$: There is no significant difference in the academic performance of students in 2023 Mathematics Senior Secondary Certificate Examination Multiple Choice Test by gender.

$H0_2$: There is no significant difference in the academic performance of students in 2024 Mathematics Senior Secondary Certificate Examination Multiple Choice Test by gender.

$H0_3$: There is no significant difference in the academic performance of students in 2025 Mathematics Senior Secondary Certificate Examination Multiple Choice Test by gender.

METHODOLOGY

The study employed survey research design using the descriptive approach as population comprise Senior Secondary School III Students who sat for the 2023-2025 West African Senior Secondary Certificate Examination, WASSCE. Multi-staged sampling procedure was employed in selection of sample. First, ballot and hat method was used to select Ojo LGA; then, inclusive method was employed to select 30 public secondary school from Ojo, LGA. Thirdly, proportionate sampling procedure using 50% was introduced to select 15 students each from the 30 schools; finally, simple random sampling procedure was adopted to select a sample of 450 students. The 2023-2025 Mathematics WASSCE Tests was used for data collection. It meets content and construct validity as presumed by the examination body. Test retest form of reliability yielded an index of .895(2023), .790(2024) and .861(2025) respectively. Analysis of Variance, ANOVA and Post-Hoc statistics were used to analyse data with the use of LISREL software and all hypotheses tested at .05 level of significance.

RESULTS

$H0_1$: There is no significant difference in the academic performance of students in 2023 Mathematics Senior Secondary Certificate Examination Multiple Choice Test by gender.

Table 1: ANOVA showing academic performance of students in 2023 Mathematics WASSCE Multiple Choice Test by gender

		Sum of Squares	Df	Mean Square	F	Sig.	Remark
Performance	Between groups	.698	1	.698			
	Within groups	3796.360	448	8.474	.082	.774	Retain $H0_1$
	Total	3797.058	449				

The ANOVA result in Table 1 shows an F-value of .082 and a p- value of .774 testing at an alpha level of .05. Since the p-value is greater than the alpha level ($p>0.05$), the null hypothesis is retained, showing that there is no significant difference in the academic performance of students in the 2023 WASSCE Mathematics multiple-choice by gender. With no significant value, a Post-Hoc test of comparison to determine where the difference lies is not needed.

$H0_2$: There is no significant difference in the academic performance of students in 2024 Mathematics Senior Secondary Certificate Examination Multiple Choice Test by gender.

Table 2: ANOVA showing academic performance of students in 2024 Mathematics WASSCE Multiple Choice Test by gender.

		Sum of Squares	Df	Mean Square	F	Sig.	Remark
Performance	Between groups	.733	1	.733	.109	.742	Retain $H0_2$
	Within groups	3028.387	448	6.760			
	Total	3029.120	449				

The ANOVA result in Table 2 shows an F-value of .109 and a p- value of .742 testing at an alpha level of .05. Since the p-value is greater than the alpha level ($p>0.05$), the null hypothesis is retained, showing that there is no significant difference in the academic performance of students in the 2024 WASSCE Mathematics Multiple-Choice Test by gender. With no significant value, a Post-Hoc test of comparison to determine where the difference lies is not needed.

$H0_3$: There is no significant difference in the academic performance of students in 2025 Mathematics West African Senior Secondary Certificate Examination Multiple Choice Test by gender.

Table 3: ANOVA showing Academic Performance of students in 2025 Mathematics WASSCE Multiple MCT by gender

		Sum of Squares	Df	Mean Square	F	Sig.	Remark
Performance	Between groups	1.937	1	1.937	.230	.032	Reject $H0_3$
	Within groups	3774.083	448	8.424			
	Total	3776.020	449				

The ANOVA result in Table 3 shows an F-value of .230 and a p-value of .032, testing at an alpha level of .05. Since the p-value is less than the alpha level ($p<0.05$), the null hypothesis is rejected, showing that there is a significant difference in the academic performance of students in the 2025 WASSCE Mathematics Multiple-Choice Test by gender. With a significant value, Post-Hoc test of comparison to determine where the difference lies is determined.

Table 4: Post-Hoc Test for Multiple Comparisons of the Differences in Academic Performance of Students in 2025 WASSCE Mathematics Multiple Choice Test by gender

(I) WASSCE 2025	(J) WASSCE 2025	Mean Difference (I-J)	Sig.
1 (Male)	1	.120	.624
	2	.862*	.004
2 (Female)	2	-.120	.039
	1	.741*	.012

1(Male); 2(Female)

Table 4 shows the LSD Post-Hoc Test used to determine the direction of difference in 2025 WASSCE Mathematics Multiple Choice Test, 1 to 1 is non-significant at .624 with mean difference of .120, 1 to 2 is significant at .004 with mean difference of .862; 2 to 2 is significant at 039 with mean difference of -.120, 2 to 1 is significant at .012 with mean difference of .741 respectively. Hence the difference in 2025 Mathematics test lies in 1 (Male) where sig-value of 0.004 (P<.05).

Discussion of Findings

Result from hypothesis one shows that there is no significant difference in the academic performance of students in 2023 WASSCE Mathematics Multiple Choice Test by gender. From the result in 2023 WASSCE Mathematics Multiple Choice Test, gender of the students did not in any way influence the performance level of students. In aligning with a growing body of evidence suggests that sex-related performance gaps in Mathematics have widened in recent years due to none influence of gender. This finding corroborates with that of Hyde, et al. (2019) who affirmed that given equal learning opportunities and access to resources, male and female students would perform similarly in standardized Mathematics tests irrespective of the test condition and time of administration. This non-differential can be attributed to reduction of societal stereotypes and increased advocacy for gender equity in STEM education. All things

being equal both male and female students in the 2022 cohort have relative equal opportunities and comparable levels of preparedness for the WASSCE Mathematics examination.

Also, result from hypothesis two shows that there is no significant difference in the academic performance of students in 2024 WASSCE Mathematics Multiple Choice Test by gender. In 2024 WASSCE Mathematics Multiple Choice Test gender of the students did not in any way influence the performance level of test takers. The absence of a statistically significant difference by gender supports the argument that performance variations in Mathematics is less of a function of biological differences and more influenced by learning environment, instructional quality and motivation. This finding aligns with study carried out by Liu and Wilson (2020) who identified classroom practices, teacher expectations and access to learning aids as stronger predictors of Mathematics achievement than gender. In the confines of 2024 WASSCE Mathematics Multiple Choice Test, they suggested that both male and female students may have benefited from similar curriculum coverage, teacher competence and exposure to past questions, leading to parity in performance outcomes.

Meanwhile findings from hypothesis three, revealed that there is a significant difference in the academic performance of students in the 2025 WASSCE Mathematics Multiple Choice Test by gender. In 2024 WASSCE Mathematics Multiple Choice Test, gender of the students did influenced the performance level of students. The finding that male students performed better than female students in the 2025 West African Senior School Certificate Examination (WASSCE) Mathematics Multiple Choice Test can be situated within the broader empirical literature on gender differences in mathematics achievement, particularly in objective or multiple-choice assessments. Studies from Mafikuyomi and Udofia (2025); Meremikwu et al., (2014) alluded that male students tend to exhibit higher performance in mathematics tasks that emphasize spatial reasoning and objective testing formats. Male students are naturally drawn to cognitive associated tasks where their mental ability is put to high test, function the most and most especially, quantitative related assignments. Unlike the female gender that prefers language related responsibilities, their male counterparts prefer tasks that demands less mental tasks where formulars and use of calculations are of high demand.

CONCLUSION

Based on the findings, it was concluded that given 2023-2025 SSCE Mathematics Multiple Choice Test, there was no significant difference in students' academic performance by gender in 2023 and 2024 test, while significant difference exists in 2025 Mathematics SSCE Multiple Choice Test by gender. The difference in 2025 Mathematics SSCE Multiple Choice Test was attributed to the ability, latent and interest level of male students.

RECOMMENDATIONS

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

1. Item developers should write items that will discriminate among students of different achievement levels. This will produce a varied score across learners.
2. Female students should be encouraged and motivated to develop interest and build careers around Mathematics related subjects.
3. Test developers must always introduce the use of table of specification as a guide when constructing tests.
4. Mathematics teachers should be advised to cover content of the subject while making the subject interesting for students in classes.

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The United Nations and the Implementation of International Human Rights Standards: A Comparative Analysis of Global and Regional Forums

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Abstract

The protection and promotion of international human rights standards remain central to contemporary global governance, with the United Nations (UN) serving as the primary multilateral institution for norm development, monitoring, and advocacy. Despite its normative authority and institutional legitimacy, concerns persist regarding the effectiveness of the UN in translating human rights standards into enforceable protections across member states. This paper critically examines the role of the United Nations in the implementation of international human rights standards and comparatively assesses its mechanisms alongside alternative global enforcement forums. Using a qualitative comparative analytical approach, the study evaluates key UN human rights structures in relation to alternative forums. The paper argues that while the UN remains indispensable in agenda-setting, norm codification and global advocacy, its implementation architecture is frequently constrained by political selectivity, weak enforcement capacity, state sovereignty, and institutional fragmentation. In contrast, certain forums demonstrate comparatively stronger enforcement potential, contextual responsiveness, and judicial accessibility, though they also face challenges relating to compliance, jurisdiction, and resource constraints. The study concludes that effective implementation of international human rights standards requires a complementary and multi-layered governance model in which UN mechanisms operate in synergy with regional and alternative forums such as the European Court of Human Rights, the Inter-American Court of Human Rights, the African Court on Human and Peoples' Rights, the African Commission on Human and Peoples' Rights, the ECOWAS Court of Justice, the East African Court of Justice, and other quasi-judicial and regional human rights bodies. It recommends deeper institutional coordination, enhanced compliance mechanisms, and strengthened regional adjudicatory bodies to improve accountability and human rights protection globally.

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INTRODUCTION

The United Nations (UN), since its inception in 1945, has been instrumental in the codification and implementation of international human rights standards. As the world's premier intergovernmental organization, the UN has been entrusted with the monumental task of maintaining global peace and security, a mandate that inherently includes the promotion and protection of human rights. The establishment of the UN marked a transformative moment in international relations, setting forth a new era where human rights became a central concern of global governance (Morsink, 1999).

The United Nations plays a central role in establishing and promoting universal human rights norms. However, its enforcement capacity is limited by political constraints and state sovereignty. Regional and sub-regional mechanisms, particularly the European system and courts such as the ECOWAS Court, are often more effective in securing compliance because of binding judgments, proximity to member states, and stronger accountability structures.

Nevertheless, the UN remains indispensable as the foundation of the international human rights system and as a coordinating global authority. What institutional mechanisms does the United Nations employ to implement and enforce international human rights standards? How effective is the United Nations, compared with selected regional and sub-regional enforcement mechanisms, in ensuring compliance with international human rights standards? Attempts to answer these questions form the major thrust of this study**.**

Conceptual Clarifications

United Nations (UN): According to Weiss (2015, p.1221), the United Nations is an international organization founded in 1945, currently composed of 193 Member States. The United Nations (UN) is an international organization established in the aftermath of World War II with the primary aim of preventing future wars and conflicts. It was established to promote peace, security, and cooperation based on respect for human rights and to offer a platform for dialogue among nations. The UN operates on a broad mandate that includes maintaining international peace and security, promoting sustainable development, protecting human rights, upholding international law, and delivering humanitarian aid.

Human Rights: Donnelly (2007) argues that Human rights are the basic rights and freedoms that belong to every person in the world, from birth until death. They apply regardless of where you are from, what you believe, or how you choose to live your life (p.282) .These rights are inherent to all human beings, irrespective of nationality, sex, national or ethnic origin, color, religion, language, or any other status. They include the right to life and liberty, freedom from slavery and torture, freedom of opinion and expression, the right to work and education, and many more. Everyone is entitled to these rights, without discrimination. Human rights are universal legal guarantees protecting individuals and groups against actions and omissions that interfere with fundamental freedoms and human dignity. (Office of the High Commissioner for Human Rights, n.d.).

International Human Rights Standards: Simmons (2009), views International human rights standards are principles that have been established by a variety of international treaties, conventions, and agreements to protect the fundamental rights and freedoms of individuals and groups (p.3).These standards are legally binding for the states that have ratified them and serve as a common benchmark for assessing the human rights practices of nations. The core of these standards is derived from the Universal Declaration of Human Rights, which has inspired more than 70 human rights treaties and instruments, including the International Covenant on Civil and Political Rights and the International Covenant on Economic, Social and Cultural Rights.

The main objectives of this study was to examine the roles of the United Nations in the implementation of International human rights standards and compare its effectiveness with alternative global and regional enforcement forums

This study was anchored on the Global Governance Theory, complemented by the International Regime Theory. Global Governance Theory explains that contemporary international issues such as human rights protection are governed by multiple connected institutions rather than by sovereign states alone. This makes it particularly suitable for analysing the role of the United Nations alongside regional and sub-regional forums such as the African Court on Human and Peoples' Rights and the ECOWAS Court of Justice. International Regime Theory further explains how international human rights standards operate through systems of norms, rules, and procedures that shape state expectations and behaviour (Donnelly, 2013; Risse, Ropp & Sikkink, 2013). Crucially, compliance with these norms

depends less on coercive enforcement than on processes of socialization, domestic mobilisation, and normative internalisation within state institutions (Simmons, 2009; Goodman & Jinks, 2013).Together, these theories provide a strong framework for understanding the multi-level implementation of international human rights standards and the comparative effectiveness of global and regional enforcement mechanisms.

This study adopted a qualitative research design using the comparative analytical method which is employed to assess the effectiveness of the United Nations alongside selected regional and sub-regional forums such as the African Commission on Human and Peoples' Rights, the African Court on Human and Peoples' Rights, and the ECOWAS Community Court of Justice. The study relies on secondary data sources, including treaties, official documents, judicial decisions, journal articles, and scholarly texts. Data were analysed through content analysis to identify key themes relating to norm-setting, enforcement, compliance, and institutional effectiveness.

United Nation Mechanisms for Human Rights Implementation

The UN's mechanisms for human rights implementation are comprehensive, involving foundational legal documents, the operational roles of its various bodies, and the monitoring and enforcement mechanisms that ensure states adhere to international human rights standards.

a. Foundational Legal Documents - The Universal Declaration of Human Rights

(UDHR) and Subsequent Treaties

The Universal Declaration of Human Rights (UDHR) represents one of the most consequential normative achievements in the history of international relations. Adopted by the United Nations General Assembly in 1948, it established a common standard of human dignity that transcended national boundaries and laid the normative foundation for the entire international human rights system. Far from being a mere symbolic gesture, the UDHR carries substantive moral and legal weight that continues to shape global governance as Morsink (1999) and Sikkink (2017) demonstrated.

Simmons (2009) noted that subsequent treaties have built upon the foundation of the UDHR, providing a more detailed and legally binding framework for the protection of human rights. These treaties have established various monitoring bodies, known as treaty bodies, which are committees of independent experts that review the compliance of state parties with their treaty obligations. The treaties have also been instrumental in shaping national legislation and policies around the world, reflecting the principles enshrined in the UDHR.

Roles of Various UN Bodies in Human Rights Implementation

The UN's approach to human rights implementation is multi-faceted, involving a range of bodies and mechanisms that work collaboratively to promote and protect human rights globally. The United Nations has established a comprehensive framework for the promotion and protection of human rights, involving various bodies and mechanisms:

- **Human Rights Council:** The United Nations Human Rights Council Human Rights Council (HRC), as viewed by Philip Alston and Jason Morgan-Foster (2008), is an intergovernmental body within the United Nations system responsible for strengthening the promotion and protection of human rights globally. It addresses situations of human rights

violations and makes recommendations on them (Alston & Morgan-Foster, 2008, p. 184). The HRC has the authority to discuss all thematic human rights issues and situations that require its attention throughout the year, including the ability to convene special sessions to respond to urgent human rights situations.

- **General Assembly:** As noted by Mehmet Turan (2023), the General Assembly plays a pivotal role in the development of international human rights law. It is the main deliberative, policymaking, and representative organ of the United Nations, with a broad mandate to discuss and make recommendations on matters within the scope of the UN Charter (Turan, 2023, p. 52).The General Assembly's Third Committee (Social, Cultural, and Humanitarian) addresses most agenda items relevant to human rights, including the rights of women, children, and indigenous peoples, and engages in interactive dialogues with States and various special procedures on these issues.

- **Treaty Bodies:** According to the Office of the United Nations High Commissioner for Human Rights, the Treaty Bodies are committees of independent experts that monitor the implementation of the core international human rights treaties. Each Treaty Body corresponds to one of the nine core international human rights treaties and reviews the compliance of State parties with their treaty obligations. These bodies are essential components of the human rights protection system, reviewing State reports, engaging in dialogues with States, and providing recommendations to ensure adherence to human rights standards. (Alston & Morgan-Foster, 2008).
- **Special Procedures:** As noted by the Office of the United Nations High Commissioner for Human Rights, Special Procedures consist of independent human rights experts who report and advise on human rights from both thematic and country-specific perspectives. They address specific human rights issues or country situations and are an essential part of the UN's human rights machinery. Their work includes investigating, monitoring, and reporting on human rights conditions, as well as providing recommendations for improvement. (Turan, 2023).
- **Universal Periodic Review (UPR):** The Office of the United Nations High Commissioner for Human Rights describes the Universal Periodic Review as a unique process that involves the review of the human rights records of all UN Member States. It provides an opportunity for each State to declare the actions they have taken to improve human rights and fulfill their obligations. The UPR fosters accountability and encourages States to commit to addressing human rights challenges. (Alston & Morgan-Foster, 2008).
- **Office of the High Commissioner for Human Rights (OHCHR)**: The Office of the High Commissioner for Human Rights is the leading UN entity on human rights. It plays a pivotal role in coordinating the various human rights mechanisms within the UN system. It provides expertise, substantive support, and strengthens the capacity of States to comply with their human rights obligations. The OHCHR also works to mainstream human rights across all UN programs, ensuring that human rights are integrated into broader UN efforts. (Turan, 2023).
- **Other UN Entities:** According to the Office of the United Nations High Commissioner for Human Rights, several other UN entities play significant roles in the implementation of human rights. UNICEF focuses on children's rights, UN Women on gender equality and the empowerment of women, and the UN Development Programme on broader development goals that include various human rights dimensions. These organizations work within their mandates to contribute to the overall human rights framework, addressing specific needs and vulnerabilities. (Alston & Morgan-Foster, 2008).

b. Monitoring and enforcement mechanisms

The United Nations (UN) employs a robust framework of monitoring and enforcement mechanisms to ensure adherence to human rights standards globally. These mechanisms are pivotal in assessing the compliance of states with their human rights obligations and include both treaty-based bodies and charter-based bodies.

The Human Rights Committee and the Committee on the Elimination of Discrimination Against Women, are composed of independent experts who monitor the implementation of core international human rights treaties. They conduct periodic reviews of state parties' reports, consider individual complaints, and may conduct confidential inquiries to investigate and address human rights violations. Example of success story is the Convention on the Rights of the Child- this one of the most universally accepted human rights treaties, reflecting the UN's capacity to galvanize global support for children's rights. Its implementation has led to tangible changes in national legislations, emphasizing the importance of child welfare and education. The convention's near-universal ratification demonstrates the UN's influential role in shaping global human rights norms.

An example of failure story is the Syrian Civil War - The situation highlights the challenges the UN faces in navigating geopolitical rivalries and the limitations of its enforcement mechanisms without unified international backing. The Syrian conflict presents a stark example of the UN's struggles with enforcing human rights in situations of complex international conflict. Despite the UN's efforts, including peace talks and humanitarian aid, the resolution of the conflict remains elusive.

Strengths and Successes in United Nations Human Rights Implementation

The United Nations has made measurable and historically significant contributions to the promotion and protection of human rights since its establishment in 1945. While its limitations are well documented, an honest assessment of the UN human rights system must acknowledge the normative, institutional, and practical achievements that have shaped global governance and improved lived conditions for millions of people worldwide (Sikkink, 2017).

Establishing Universal Standards: The adoption of the Universal Declaration of Human Rights in 1948 constitutes one of the most consequential normative developments in modern international history. The UDHR established a comprehensive catalogue of civil, political, economic, social, and cultural rights applicable to every human being regardless of nationality, ethnicity, or religion, laying the foundation upon which the entire architecture of international human rights law was subsequently built (Morsink, 1999). Its moral authority has proven far-reaching: over 90 national constitutions drafted after 1948 incorporate rights language directly traceable to the UDHR, including those of South Africa (1996) and Brazil (1988), demonstrating its transformative influence on domestic legal orders (Sikkink, 2017).

Expanding the Legal Framework: Building on the UDHR's normative foundation, the UN has developed a robust body of binding international human rights law. Landmark instruments such as the Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW, 1979) and the Convention on the Rights of the Child (CRC, 1989) have translated universal principles into specific, enforceable legal obligations (Simmons, 2009). CEDAW, ratified by 189 states, has been a direct catalyst for legislative reform in numerous countries. Tunisia, for instance, abolished its requirement for a male guardian's consent in marriage following CEDAW review recommendations, while Rwanda's constitutional quota system,

influenced by international gender norms, propelled women to occupy over 60 percent of parliamentary seats, the highest proportion in the world (UN Women, 2023; Tripp, 2019). The CRC, the most widely ratified human rights treaty in history, has contributed to measurable reductions in child labour globally, with the International Labour Organisation (ILO, 2022) reporting a decline from 246 million child labourers in 2000 to approximately 160 million by 2020, attributing part of this progress to the normative pressure generated by CRC ratification and monitoring.

Treaty Body Monitoring Mechanisms: The UN treaty body system, comprising ten expert committees that monitor state compliance with core human rights conventions, provides a structured accountability architecture that would otherwise be absent from international relations (Alston and Goodman, 2013, p. 892). The Committee on the Elimination of Racial Discrimination (CERD), established in 1970, played a significant role in sustaining international pressure on the apartheid regime in South Africa, contributing to the normative isolation that preceded its eventual dismantlement (Donnelly, 2013). More recently, CERD's 2018 review of China's treatment of Uyghur Muslims in Xinjiang represented one of the few formal international fora in which the issue received authoritative scrutiny, demonstrating the committee's continued relevance even in politically sensitive contexts.

Special Procedures: The UN Human Rights Council's system of Special Procedures, comprising over 40 thematic and country-specific mandates, constitutes one of the most flexible and responsive tools in the UN human rights architecture (Alston and Goodman, 2013, p. 893). Independent mandate holders can conduct country visits, receive individual complaints, and issue public reports without requiring Security Council approval, circumventing the veto problem that hampers other mechanisms. The Special Rapporteur on the Right to Food, a mandate established in 2000, has been particularly consequential: advocacy efforts contributed to the recognition of the right to food in India's National Food Security Act (2013), extending legal entitlements to approximately 800 million people. Similarly, the Special Rapporteur on Torture has generated sustained pressure on states to ratify the Optional Protocol to the Convention Against Torture (OPCAT), resulting in over 90 ratifications and the establishment of national preventive mechanisms in countries including Nigeria, Brazil, and the United Kingdom.

The Universal Periodic Review: The Universal Periodic Review, established in 2006, introduced a genuinely inclusive accountability mechanism by subjecting every UN member state, including the permanent members of the Security Council, to periodic peer review of their human rights record (Freedman, 2013). Unlike treaty body reviews, which are limited to states parties, the UPR creates a universal floor of scrutiny. Studies have found that a meaningful proportion of UPR recommendations are accepted and subsequently implemented, particularly in areas such as ratification of human rights instruments, establishment of national human rights institutions, and legislative reform (McMahon and Ascherio, 2012). The UPR process prompted Bahrain, for instance, to establish a national human rights institution and implement policing reforms following its 2012 review, albeit with continued concerns about full implementation.

Overall Assessment: The cumulative impact of these mechanisms is not negligible. As Sikkink (2017) argues extensively, empirical evidence demonstrates that countries with more human rights prosecutions and stronger engagement with international human rights institutions tend, over time, to show improved human rights outcomes. The UN human rights system is imperfect and frequently outpaced by the scale of violations it confronts, but its

normative, institutional, and practical contributions to the global human rights project remain both real and retrievable from the evidence.

Challenges in United Nation's Human Rights Implementation

Despite the institutional breadth of the United Nations human rights framework, its practical effectiveness remains constrained by structural, political, and resource-related limitations. These challenges are not incidental; they reflect deep tensions between the Universalist aspirations of international human rights law and the realities of a state-centric global order.

Weak Enforcement Mechanisms: The most fundamental limitation of the UN human rights system is its absence of binding enforcement authority. Unlike trade or security regimes, human rights compliance depends almost entirely on state consent and political will, creating a framework that is normatively ambitious but operationally fragile. States with significant geopolitical or economic leverage are particularly positioned to resist scrutiny without consequence, undermining the principle of universality on which the entire framework rests (International Institute for Sustainable Development, 2016). Scholars such as Philip Alston have long argued that without meaningful accountability mechanisms, the UN risks reducing human rights to a declaratory exercise rather than a lived reality.

The Veto Problem in the Security Council: The UN Security Council's capacity to respond decisively to human rights crises is structurally compromised by the veto privilege afforded to its five permanent members. When violations occur in or are connected to the interests of a veto-holding state, the Council is effectively immobilised, unable to authorize intervention or impose consequences. This dynamic has been particularly visible in conflicts where permanent members or their strategic partners are implicated, exposing a fundamental contradiction between the Council's mandate to maintain international peace and security and its paralysis in the face of politically inconvenient atrocities (International Institute for Sustainable Development, 2016). Reform proposals, including the Accountability, Coherence and Transparency (ACT) Group's voluntary veto restraint initiative, have gained little traction among the P5.

Resource Constraints: The UN's human rights machinery is chronically underfunded relative to the scope of its mandate. The Office of the United Nations High Commissioner for Human Rights (OHCHR) operates on a comparatively modest budget, limiting its capacity to conduct country-level monitoring, support national human rights institutions, and engage meaningfully in post-conflict settings (Office of the United Nations High Commissioner for Human Rights, n.d.). This financial gap is not merely administrative; it has substantive consequences for which situations receive attention and which are effectively left unaddressed, introducing a de facto hierarchy of concern that contradicts the indivisibility of human rights.

Political Selectivity and the Subordination of Human Rights to State Interests: A persistent challenge within the UN system is the tendency of member states to instrumentalise human rights discourse in pursuit of national interests. Human rights concerns are selectively emphasized or suppressed depending on diplomatic alignments, trade relationships, and geopolitical calculations. This selective application erodes the credibility of the system and provides cover for violating states to dismiss scrutiny as politically motivated. The result is a pattern of inconsistency that weakens the normative authority of international human rights standards (Office of the United Nations High Commissioner for Human Rights, n.d.).

Duplication of Reporting Requirements and Non-Reporting: The proliferation of international human rights treaties and their corresponding monitoring bodies has generated a reporting architecture that many states, particularly those with limited administrative capacity, struggle to navigate. Overlapping mandates, duplicative reporting cycles, and inconsistent follow-up mechanisms have diluted the effectiveness of the treaty body system (Office of the United Nations High Commissioner for Human Rights, n.d.). Compounding this is the problem of non-reporting, where states simply fail to submit required reports without consequence, leaving monitoring bodies with insufficient information to make meaningful assessments. The 2020 treaty body strengthening process acknowledged these concerns but produced only incremental reforms.

Conservative Backlash and the Retreat from Universal Standards: In recent years, a discernible conservative backlash against international human rights norms has emerged, with an increasing number of governments reasserting national sovereignty as a counterweight to universal standards. This has manifested in the deliberate omission of human rights language from bilateral and multilateral agreements, the withdrawal or non-ratification of key instruments, and the framing of international oversight as an infringement on domestic jurisdiction (International Institute for Sustainable Development, 2016). This trend represents not merely political resistance but an ideological challenge to the foundational premise that human rights are universal, inalienable, and not subject to cultural or governmental exception.

Institutional Fragmentation and Coordination Failures: The dispersal of human rights responsibilities across numerous UN agencies, treaty bodies, special procedures, and funds has produced a system characterised by institutional fragmentation. Each body operates within its own mandate, with limited mechanisms for cross-institutional coordination or coherent strategic planning. The consequence is duplication of effort in some areas and significant gaps in others, with no single body empowered to ensure system-wide coherence. Mainstreaming human rights across the broader UN system, including the peace and security and development pillars, has remained aspirational rather than operational, despite repeated commitments by successive Secretaries-General.

Comparative Analysis with Alternative Global Forums

When comparing the United Nations' human rights framework with other international organizations and forums, it's important to identify entities that operate independently of the UN system. These organizations have their own charters and mechanisms for promoting and protecting human rights, distinct from the UN's framework. They provide regional perspectives and solutions tailored to their member states' needs, reflecting cultural, political, and economic diversity. While they share the common goal of human rights protection, their methods and degrees of enforceability can vary significantly from the UN's approach.

- ✓ **ASEAN Intergovernmental Commission on Human Rights (AICHR)**: This was established by the Association of Southeast Asian Nations (ASEAN), AICHR serves as a regional human rights body. It promotes human rights within the ten ASEAN member states but operates independently from the United Nations. AICHR focuses on cooperation and capacity building rather than enforcement, which contrasts with the UN's treaty-based, legally binding approach.

- ✓ **Organization of American States (OAS):** The OAS is a regional organization in the Americas, not under the UN umbrella. It has its own human rights system, including the Inter-American Commission on Human Rights and the Inter-American Court of Human

Rights. These bodies monitor and adjudicate human rights issues in member states, offering a regional alternative to the global UN system.

- ✓ **European Court of Human Rights (ECHR):** The ECHR focuses on adjudicating individual complaints and issuing binding judgments based on the European Convention on Human Rights. It has taken a procedural turn in its review methodology, analyzing both substantive claims and the domestic process for protecting human rights. The European Court of Human Rights' decisions have a significant influence on national legislation and court decisions within member states, leading to improvements in human rights protections (Brown, 2022, p. 117).
- ✓ **Inter-American Commission on Human Rights (IACHR):** The IACHR addresses human rights issues through monitoring, reporting, and the adjudication of individual cases. Garcia, M., & Rodriguez, E. (2024) argued that it also adopts precautionary measures to prevent imminent harm and engages in mediation sessions for friendly settlements. The IACHR's work has led to progress in reducing procedural backlog, implementing inter-American standards, and fostering institutional transparency in the Americas.
- ✓ **African Commission on Human and Peoples' Rights (ACHPR):** The African Commission on Human and Peoples' Rights (ACHPR) operates under the African Charter, promoting and protecting human and collective rights throughout the African continent. It considers individual complaints and interprets the African Charter on Human and Peoples' Rights. A. Kone and B. Diop (2023, p. 76) stated that the ACHPR's activities have led to the discovery of human rights violations, such as the mass grave in Libya, and it works towards addressing the repercussions of such events.

CONCLUSION

The United Nations, as an institution with a unique global mandate, has played an indispensable role in the implementation of international human rights standards. Its position as a universally recognized authority provides it with an unparalleled platform to advocate for human rights. The extensive mechanisms that the UN has developed, which have evolved over time, demonstrate its commitment to this cause. However, it is crucial to acknowledge that the UN is not without obstacles. The challenges it faces, including bureaucratic issues, political biases, and limited enforcement capabilities, these affect its effectiveness. Despite these obstacles, the UN's ongoing efforts to refine its processes and respond to global human rights issues affirm its status as the most fitting platform for the monumental task of upholding human dignity worldwide. Hence, the united nation is the appropriate forum for implementing international human rights standards.

RECOMMENDATIONS

The study recommends among others a deeper institutional coordination, enhanced compliance mechanisms, and strengthened regional bodies as essential reforms for improving global human rights accountability. Deeper institutional coordination would no doubt foster synergy between universal and regional human rights institutions, thereby reducing fragmentation and promoting normative consistency. Enhanced compliance mechanisms would ensure that states move beyond formal treaty ratification toward substantive implementation through robust monitoring, follow-up, and accountability procedures. Strengthening regional bodies would further improve access to justice by empowering courts and commissions that are often better positioned to address context-specific violations and provide enforceable remedies.

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Prevalence of Panic Attacks Among Secondary School Students in Ikpoba Okha Local Government Area of Edo State, Nigeria

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Abstract

This study investigated prevalence of panic attacks among secondary school students in Ikpoba-Okha Local Government of Edo State. Four research questions were raised and three hypotheses formulated to guide the study at 0.05 level of significance. Descriptive survey research design was adopted. The population comprised all the Senior Secondary School II (SSS 2) Students in Ikpoba-Okha Local Government Area. Stratified random sampling techniques were used to sample 300 SSS 2 Students. The instruments used for data collection was Self-report scales titled the "panic attack inventory" (PAI) which were content and face validated by three Psychometricians. Reliability coefficient of .85 was obtained using the Cronbach Alpha method. The data collected were analyzed using descriptive statistic (mean and standard deviation) and One-way ANOVA. The findings revealed that the level of the prevalence of panic attacks among secondary school students is severe, the panic attack among secondary school students does not significantly differ by age, sex and socio economic status respectively in Ikpoba-Okha Local Government Area. Based on the findings, it was recommended that Students should be encouraged to talk about their panic attacks irrespective of their sex, age or social economic status while Counsellors, Government, educational institutions, and schools should all promote anti-bullying policies.

Keywords: Panic Attack, Sex, Age and Socio-economic Status.

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INTRODUCTION

Secondary students are adolescents who are at the mercy of a wide range of stressors, such as expectations from school authority, home, and religious leadership. They are under pressure from peers, parents, society, teachers, and themselves to perform academically well and coexist socially. On a daily basis, they practically face unique challenges due to academic pressure, societal expectations, and their transitional adolescent nature. They make efforts to live up to these expectations, often and occasionally. They appear to be gripped by a dread of missing out that pushes them and finally prevents them from fitting into the cycle of expectations. Most of the time, this causes them to developed panic disorder (attack).

Panic disorder which is otherwise refers to attack is a debilitating anxiety disorder that has a serious impact on adolescents' social and academic functioning and general wellbeing. It is a sudden, temporary feeling of fear and strong physical reactions in response to ordinary/nonthreatening situations. Panic attacks can be sudden and overpowering (Black 2021). According to Safai and West (2022), panic attack begins suddenly and most often peaks within 10 to 20 minutes. Some symptoms continue for an hour or more. They added that it typically has a negative impact across different areas of adolescents' lives, including social interactions and academic functioning. Newman (2016) defined panic attacks as "discrete

episodes of intense fear, apprehension, or terror that are accompanied by several physical symptoms. It is described as an incapacitating anxiety disorder which is capable of having a serious impact on the social development, academic functioning, and general wellbeing of school-going children".

Panic attacks may change behaviour and function at home, school, or work. Panic attacks, if left unmanaged, can lead to significant disruptions in daily life, potentially impacting work, social interactions, and overall quality of life. They can also increase the risk of developing other mental health conditions like anxiety disorders, phobias, and even depression. Additionally, chronic panic attacks can have physical consequences, potentially exacerbating existing heart conditions or leading to new health issues Arntz (2021) maintained. Adolescent having a panic attack, may sweat a lot, have difficulty breathing, feel heart's racing and may feel like having a heart attack.

When panic attack happens suddenly, symptoms usually peak within few minutes after it starts and then disappear soon after. Hence, Salami, and Walker (2019) described panic attack as an abrupt period of intense fear or discomfort accompanied by four or more of the following thirteen systemic symptoms: palpitation, pounding heart, accelerated heart rate, sweating, trembling or shaking, shortness of breath or feeling of smothering, feelings of choking, chest pain or discomfort, nausea or abdominal distress, feeling dizzy, unsteady, lightheaded, or faint, chills or heat sensations, paresthesias (numbness or tingling sensations), derealisation (feeling of unreality) or depersonalisation (being detached from oneself), feeling of losing control or going crazy and fear of dying.

Panic attack must be distinguished from various psychiatric disorders and physical conditions that can have associated panic symptoms. Some of these conditions include other anxiety disorders (including specific phobias and posttraumatic stress disorder), substance use disorders (including stimulant abuse or withdrawal from sedative agents), or medical conditions, including hyperthyroidism (Assari, 2019). Furthermore, the clinical presentation of panic disorder may vary depending on the age of presentation and may make it difficult for the clinician to assess and ascertain the significance of such symptoms (Chege, Munene, &Oladipo, 2018).

Panic attack and its complications, if not recognized and treated can be devastating. Panic attacks can interfere with children or adolescents' relationships, schoolwork, and normal development. This attack can lead to not just severe anxiety but can also affect other parts of a child's mood or functioning. Children and adolescents with panic disorder may start to feel anxious most of the time, even when they are not having panic attacks. Some begin to avoid activities where they fear a panic attack may occur or events where help may not be available. For example, a child may be reluctant to go to school or be separated from his or her parents. In severe cases, the child or adolescent may be afraid to leave home. As with other anxiety disorders, this pattern of avoiding certain places or situations is called "agoraphobia." Some youth with panic disorder can develop severe depression and may be at risk of suicidal behaviour. Kambuga (2020) opined that, as an attempt to decrease panic attacks, some adolescents with panic attack may result to the use alcohol or drugs.

Hartmann (2016) maintained that panic attack in adolescents can be difficult to diagnose. He added that it can lead to many visits to physicians and medical tests that are costly and even potentially painful. When properly evaluated and diagnosed, panic attack usually responds well to treatment. Adolescents with symptoms of panic attacks should first be evaluated by their family physician or pediatrician. If no other physical illness or condition is

found as a cause for the symptoms, a comprehensive evaluation by a child and adolescent psychiatrist should be obtained. Its prevalence has attracted attention from mental health researchers and counsellors. Kambuga, (2016) asserts that, "Panic attacks are common in adolescents, occurring in anywhere between 6–63% of adolescent community samples. It is a debilitating anxiety disorder that has a serious impact on adolescents' social and academic functioning and general well-being which is experienced by around 1 to 3% of the adolescent population (Baker, Hollywood & Waite, 2022).

Panic attacks often include physical symptoms that might feel like a heart attack, such as trembling, tingling, or rapid heart rate. The symptoms can include: pounding heart or chest pain (feeling like having a heart attack), shortness of breath, dizziness, hot flashes, or chills, nausea, sweating, shaking, or tingling in fingers or toes, feeling like a loss of control, or having a fear of dying or other unrealistic thoughts. Mild worrying in kids and teens is normal. But a panic attack may dramatically affect a student's life by interrupting normal activities irrespective if their age, socioeconomic status and sex.

Age can play a significant role in the occurrence of panic attacks among secondary school students. Most secondary school students are adolescents. Adolescence is a time of immense change and development, both physically and emotionally. The hormonal fluctuations, coupled with the pressures of academic performance and social acceptance, can create a perfect storm for anxiety and panic. During this stage of life, teenagers are still learning to regulate their emotions and cope with stress effectively. They may lack the necessary skills to manage overwhelming feelings, leading to panic attacks as a response to perceived threats or stressors. Adults with panic attack often report having had panic symptoms starting in childhood or early adolescence. In most such individuals, panic attacks may have either been misdiagnosed or not come to clinical attention. Epidemiological studies have reported that panic attacks may not be rare in the community samples of adolescents, although panic disorder may not be commonly reported. For instance, Goodwin and Gotlib (2019) reported a prevalence of 3.3% of panic attacks from among 1,285 youth, aged 9–17 years, whereas Whitaker (2020) reported lifetime prevalence of panic disorder to be 0.6% using a structured interview with 5,000 students aged 14–17 years.

Socioeconomic status (SES) is another factor plays a significant role in the experience and prevalence of panic attacks. Individuals from lower SES backgrounds are often more likely to experience panic attacks due to increased stress, limited access to resources, and higher vulnerability to negative life events. Individuals with lower SES often face challenges like financial insecurity, unemployment, and inadequate living conditions, which contribute to higher stress levels and a greater likelihood of experiencing negative life events.

Sex is another factor to be considered in panic attack among secondary school students. Chege, Munene, and Oladipo (2018) maintained that panic attack occurs more frequently in women than in men. While panic attacks can affect individuals of any gender, research suggests that there may be some gender differences in the prevalence and manifestation of these episodes among students (Essau, 2019). Studies have shown that girls are more likely than boys to experience panic attacks during adolescence (Pereira, Barros, Mendonca & Muris, 2019; Essau, 2019 and De Wit, Karioja, Rye &Shain, 2019). The hormonal changes that occur during puberty, coupled with the societal pressures and expectations placed on girls, may contribute to this higher prevalence.

Secondary school students on a daily basis practically face unique challenges due to academic pressure, societal expectations, and their transitional adolescent nature which can

triggers panic attack. Research has shown that the increasing number of students faced with problematic panic attack is worrying and the situation is made worse by the fact that these students are receiving limited attention (Miller, Gold, Laye-Gindhu, Martinez, Yu & Waechtler, 2019). As the secondary school students' transit from one stage of development to another, panic attack may impact them negatively preventing them to achieve the developmental milestones as desired. Base on this, the research seeks to investigate the prevalence of panic attacks among secondary school students in Ikpoba-Okha Local Government of Edo State.

Statement of the Problem

Panic attacks among secondary school students in the Ikpoba-Okha local government area represent a significant mental health concern that has received inadequate attention in existing literature. The prevalence of panic attacks among secondary school students remains largely unknown due to limited research. The absence of accurate prevalence data hinders the development of targeted mental health intervention programs for this vulnerable group. Without a clear understanding of the magnitude of the problem, educators, policymakers, and healthcare providers lack the necessary information to address the specific needs and challenges faced by these students.

Despite the crucial developmental phase of adolescence and the unique stressors faced by these students, there is lack of comprehensive research on the prevalence and associated factors of panic attacks within this population. Furthermore, the existing literature fails to adequately explore the factors that associates with panic attacks among secondary school students in Ikpoba-Okha Local Government Area of Edo State most of which are foreign works which focused only on anxiety and panic disorders (Muthusamy et al, 2022; Nag et al, 2019). There is a significant gap in the existing literature concerning the prevalence, associated factors, and implications of panic attacks among secondary school students. Bridging this gap through further research is essential to inform the development of targeted interventions, promote mental health awareness, and improve the well-being of secondary school students in Ikpoba-Okha local government area, Edo state.

Purpose of the Study

The major purpose of this study was to examine the prevalence of panic attacks among secondary school students in Ikpoba Okha Local Government of Edo State. Specifically, it aimed to find out:

1. the level of the prevalence of panic attacks among secondary school students in Ikpoba-Okha Local Government Area of Edo State.
2. how panic attack among secondary school students differ by age in Ikpoba-Okha Local Government Area.
3. how panic attack among secondary school students differ by sex in Ikpoba-Okha Local Government Area?
4. how panic attack among secondary school students differ by socio economic status in Ikpoba-Okha Local Government Area.

Research Questions

To guide this study the following research questions were raised:

1. What is the level of the prevalence of panic attacks among secondary school students in Ikpoba-Okha Local Government Area of Edo State?
2. How does the panic attack among secondary school students differ by age in Ikpoba-Okha Local Government Area?
3. How does the panic attack among secondary school students differ by sex in Ikpoba-Okha Local Government Area?
4. How does the panic attack among secondary school students differ by socio economic status in Ikpoba-Okha Local Government Area?

Hypotheses

To further guide the study, the following hypotheses were raised.

1. The panic attack among secondary school students does not significantly differ by age in Ikpoba-Okha Local Government Area.
2. The panic attack among secondary school students does not significantly differ by sex in Ikpoba-Okha Local Government Area.
3. The panic attack among secondary school students does not significantly differ by socio economic status in Ikpoba-Okha Local Government Area.

METHODOLOGY

The descriptive survey research design was adopted for the study as the research design. The population of the study comprised of 4025 SSS 2 students in Twenty-one (21) public senior secondary schools in the local government area of Ikpoba-Okha. A total of three hundred (300) senior secondary two (SS2) students from 21 public schools in Ikpoba-Okha Local Government Area were selected as the sample for the study. Stratify and simple random sampling technique involving multi-stage was used. Stage 1, the researcher stratified the schools into male schools, female schools and mixed school (three school types). Simple random sampling involving balloting method was used to select two schools from each of these stratified schools making a total of six (6) schools. The researcher carried out the balloting method by writing the names of the schools on pieces of paper and then put them inside a basket. A school was then picked at a random without replacement. This was done six (6) times to get six schools as a sample for the study. Stage 2, fifty (50) students were randomly selected from each the sampled schools using balloting method making a total of three hundred students for the sample.

The instrument for the data collection in the study was Self-report scales titled the "panic attack inventory (PAI). The PAI has two sections. Section A contains demographic variables such as age, sex, and socioeconomic status (parents' educational attainment, parents' income level and parents' occupation). Section B was made up of Thirteen (13) items which measure the symptoms of panic attack experienced by the respondents. The items were on a modified four likert type (All the time, Most of the time, Some of the time and Never).

The instruments were validated by three researchers and the reliability was ascertained using Cronbach alpha Statistics reliability method and a coefficient value of .85 was obtained. This indicates that instrument was reliable for use. The researcher with the aid of the teachers administered the instrument to the sampled students. Descriptive statistic (mean and standard deviation) was used to answer research question one (mean of 1 – 15 indicate none, 16 – 31 mild panic attack while 32 and above severe panic attack), while ANOVA statistics was used to test hypotheses 1 and 3 (research question 2 and 4 respectively) and independent sample t-test was used to test hypothesis 2 (research question 3) at 0.05 level of significance. The

responses were worded as: All the time = 4, Most of the time = 3, Some of the time = 2 and Never =1

RESULTS

Research Question 1

What is the level of the prevalence of panic attacks among secondary school students in Ikpoba-Okha Local Government Area of Edo State?

Table 1: Mean and Standard Deviation responses on the level of the Prevalence of Panic Attacks Among Secondary School Students

S/N	Items	Mean	Std. Dev.	Mean Rank	Remarks
1	Fear of dying	2.90	0.58	1st	High
2	Flushes (Hot Flashes)	2.88	0.62	2nd	High
3	Chest pain or discomfort	2.78	0.60	3rd	High
4	Fear of going crazy	2.67	0.59	4th	High
5	Feeling of unreality	2.67	0.58	5th	High
6	Numbness or tingling sensation	2.60	0.63	6th	High
7	Nausea or abdominal distress	2.58	0.60	7th	High
8	Feeling of choking	2.58	0.60	8th	High
9	Sweating	2.56	0.59	9th	High
10	Palpitation	2.50	0.59	10th	High
11	Feeling dizzy	2.48	0.59	11th	Low
12	Trembling	2.47	0.59	12th	Low
13	Shortness of breath	2.33	0.59	13th	Low
		2.61	**0.59**		

N = 295, Criterion Mean = 2.5

Table 1 contains the descriptive data on the average responses for each of the scale items of panic attacks among secondary school students in Ikpoba-Okha Local Government Area of Edo State. From analysis it was observed that, the average (item means are greater than criterion mean 2.5) were 10 (items 1- 10) with mean ranging from 2.50 – 2.90 while others were less than 2.50. The fear of dying appears to be the highest while shortness of breath being the least among them. Also, the analysis showed an average mean of 2.61 and standard deviation of 0.59. Since the mean of 2.61 is greater than the cluster mean of 2.5 it is therefore concluded that there is panic attack among adolescents in Ikpoba-Okha Local Government Area.

Hypothesis One

There is no significant difference in the level of panic attacks among secondary school students of different age categories in Ikpoba-Okha Local Government Area.

Table 2: Mean and Standard Deviation of responses on level of Panic Attack among Secondary School Students by Age in Ikpoba-Okha Local Government Area

Age Bracket	Number of Students	Mean	Std. Dev.
Below 15 years	24	32.79	5.43
15 - 20 years	269	31.84	6.12
21 years and above	2	35.50	4.95
Total	295	31.94	6.06

Table 2 shows the means and standard deviations of students in their age categories. From the table those below 15 years of age have mean of 32.79 and a standard deviation of 5.43, those between 15 years and 20 years have mean of 31.84 and standard deviation of 6.12while those that are 21 years and above have mean of 35.50 and standard deviation of 4.95. Test for significant difference is presented in Table 3.

Table 3: ANOVA test of Difference in Panic Attack by age Brackets

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	45.436	2	22.718	.618	.540
Within Groups	10742.585	292	36.790		
Total	10788.020	294			

***.540* > .05 = Not Significant**

Table 3 shows an F value .618 and a p-value of .540. testing at an alpha level of 0.05; the p-value is greater than the alpha level, so the null hypothesis which states that "The panic attack among secondary school students do not significantly differ by age in Ikpoba-Okha Local Government Area" is retained.

Hypothesis Two

The panic attack among secondary school students do not significantly differ by sex in Ikpoba-Okha Local Government Area.

Table 4: t-test of Difference in Panic Attack among Secondary School Students by sex in Ikpoba-Okha Local Government Area

Sex	N	Mean	Std. Dev.	df	t-value	p-value (Sig. 2-tailed)
Male	154	31.59	5.75			
				293	**-1.042**	**.298**
Female	141	32.33	6.37			

α = .05, p > .05 = Not Significant

Table 4 shows difference in panic attack among secondary school students by sex in Ikpoba-Okha Local Government Area. From the table, the number of respondents male (N) = 154 while female (N) = 141. Their Mean values are 31.59 and 32.33 while standard deviations are 5.75 and 6.37 respectively. The t-value of -1.042 is not significant, because, the *p-value* (.298) is greater than *alpha level*. Therefore, the null hypothesis is retained. This implies that the sex of the student is not a strong factor in peer group panic attack among students.

Hypothesis Three

There is no significant difference in the level of panic attacks among secondary school students from families of different socio-economic classes in Ikpoba-Okha Local Government Area.

Table 5: Mean and Standard Deviation of Panic Attack among Secondary School Students by SES in Ikpoba-Okha Local Government Area

SES	Number of Students	Mean	Std. Dev.
Low	25	32.84	4.81
Middle	153	31.51	5.68
High	117	32.32	6.74
Total	295	31.94	6.06

Table 5 shows the means and standard deviations of students in their SES categories. From the table those (25) in low SES have mean of 32.84 and a standard deviation of 4.81, those (153) in Middle SES have mean of 31.51 and standard deviation of 5.68 while those (117) in high SES have mean of 32.32 and standard deviation of 6.74.

Test for significant difference is presented in Table 6.

Table 6: ANOVA test of Difference in Panic Attack by SES Categories

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	65.126	2	32.563	.887	.413
Within Groups	10722.894	292	36.722		
Total	10788.020	294			

***.413* > .05 = Not Significant**

Table 6 shows an F value .887 and a p-value of .413. Testing at an alpha level of 0.05; the p-value is greater than the alpha level, so the null hypothesis which states that "The panic attack among secondary school students does not significantly differ by socioeconomic status in Ikpoba-Okha Local Government Area' is retained.

DISCUSSION

The findings revealed that majority of the students do experience panic attack most of the times. While a very negligible percentage of the students never experience panic attack. This implies that, the level of the prevalence of panic attack among secondary school students in Ikpoba-Okha is severe. This is due to bullying the students experience most of the time. This finding is in consonant with the finding of Alreybah (2022) who found that, the prevalence of panic attack in secondary school students is severe and also the finding of Essau (2021) who found that there is high rate of panic attacks among secondary school students.

The findings revealed that the panic attack among secondary school students do not significantly differ by age in Ikpoba-Okha Local Government Area. This finding agreed with the finding of Muthusamy (2022) who found that, panic attack among secondary school students do not significantly differ by age. But the finding disagreed with the finding of Alreybah (2022), who found that younger age had significant higher rate of panic disorder attack than others.

Also, the findings revealed that the panic attack among secondary school students does not significantly differ by sex in Ikpoba-Okha Local Government Area. This implies that the sex of the student is not a strong factor in peer group panic attack among students in Ikpoba-Okha. This finding is in disagreement with the finding of Simon (2022) who found that panic attacks were more prevalence in females than the males. The author concluded that, panic attacks among secondary school students differ by sex.

Finally, the findings revealed that panic attack among secondary school students in Ikpoba-Okha Local Government Area does not significantly differ by socioeconomic status of the students.

CONCLUSION

Based on the findings of this study, it was concluded that there is prevalence of panic attacked in among students in Ikpona-Okha Local Government Area and the panic attacks among the students is severe. However, the panic attack among the students of Ikpoba-Okha does not significantly differ by the age, sex and social economics status of the students.

RECOMMENDATIONS

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

1. Counsellors and Therapist should be employed in schools that could help bullied students remove the negative emotions that were stored when they were bullied and help them rewrite their story to remove the 'victim' role.
2. Government, educational institutions, and schools should all promote anti-bullying policies.
3. When resources permit, counsellors should liaise with school authority to organize seminars on panic attacks, its effects and ways to curb it. They should also assist the school in production of suitable stickers and fliers to discourage bullying behaviours in schools.
4. Students should be encouraged to talk about their panic disorder attacks in respective of their sex, age or social economics status.

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Assessment of Strategies for Enhancing the Teaching and Learning of Biology in Ikwuano Local Government Area, Abia State, Nigeria

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Abstract

This study examined the strategies used to enhance teaching and learning of Biology in senior secondary schools in Ikwuano Local Government Area of Abia State. The study adopted a descriptive survey research design. The population of the study consists of 1200 senior secondary class two (SS 11) students and 15 teachers from all the public secondary schools in Ikwuano Local Government Area of Abia state. Two hundred and forty (240) students and 15 teachers from the public secondary schools in the area were selected using simple random sampling technique and census sampling respectively. The instrument for data collection was "Assessment of Strategies to Enhance Teaching and Learning of Biology Questionnaire" (ASETLBQ). The questionnaire was developed based on 4-point Likert scale of strongly agree, agree, disagree and strongly disagree. The instrument was validated by two expertise in Biology education and one expert in Measurement and Evaluation. The reliability of the instrument was established using Cronbach's alpha method and reliability index of 0.79 was obtained. Mean and standard deviation were used to answer the research questions while independent sample t-test was used to test the null hypothesis at 0.05 level of significance. The result revealed that great emphasis should be made on instructional materials and monitoring of student's ability, to boost students learning and teaching of biology in secondary schools. Based on the findings the following recommendations were made: Teachers should be trained on best way of teaching Biology with appropriate strategies to enhance teaching and learning and workshop and seminar should be organized by the science teachers association of Nigeria on area of strategies in teaching and learning of biology.

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INTRODUCTION

The need for research in strategies used to enhance the teaching and learning of biology and their mode of application in improving academic performance at different levels of education, especially at the secondary school level cannot be over emphasized. The need to strengthen the process of teaching and learning in secondary schools has become increasingly important, particularly in the teaching of Biology, due to students' persistent poor academic performance and low interest in the subject. Biology is a branch of natural science which deals with the study of living organisms (plants and animals), including their structures, functioning, evolution, distribution and interrelationships. The importance of biology as a science subject stands as the bedrock upon which many professional courses such as Medicine, Pharmacy, Nursing, Biochemistry, Genetic studies, Agriculture science among others, are laid. Also, it cuts across all spheres of human endeavors including nation building, considering the role it plays in various aspect of the economy and public life such as health, manufacturing, teaching, agriculture, disease and pest control, food production, research, biotechnology and research engineering (Bena, 2019). These areas which are linked to Biology has made it a subject that

is in high demand and are subsequently with very high enrolment of students in the external examination (Senior School Certificate Examination) when compared to what is obtain in other science subjects such as Physics and Chemistry. Evidence from external examination bodies has consistently shown that students' academic performance in Biology and other science subjects in Nigeria has remained unsatisfactory over the years. For instance, the West African Examinations Council (WAEC) reported a significant decline in candidates' overall performance in the 2025 West African Senior School Certificate Examination (WASSCE), where only 38.32% of candidates obtained credits in at least five subjects including English Language and Mathematics, compared to 72.12% recorded in 2024. WAEC further attributed part of the poor performance to students' weak preparation and poor performance in objective papers, including Biology. In addition, WAEC Chief Examiners' reports over the years have revealed persistent weaknesses among Biology students such as poor expression, inability to apply biological concepts, poor diagram drawing and labeling, and inadequate understanding of technical terms which may be attributed to teaching strategy.

However, despite the importance of Biology to the society, various science educators have expressed the concern over the poor achievement of students in biology in senior secondary school over the past decades (Njoku, 2018). Many factors have been attributed to students' poor achievement in biology including: The teaching method used by Biology teachers, the learning method adopted by the students, difficult nature of the topic/concept, lack of equipment and instructional materials for teaching Biology (Ibe 2020). The West African Examination Council (WAEC) Chief Examiners reports (2022, 2023, & 2024) have consistently stated some of the weakness of the candidates to be poor answers to questions, inability to adhere to instructions, poor interpretation of questions, poor definition, teaching methods and strategies used in teaching Biology.

Meanwhile, the Teachers Institute, NTI (2018b) remarked that conventional instructional method is teacher-centered, which lays explicit emphasis on the teaching and lesser concern to students input in the learning process. According to Adeyemi, (2021) conventional instructional method is characterized by emphasis on instructor's behavior rather than student minimal responses of students to instructional materials and delayed feedback on students' performance. Therefore, the search for effective and efficient delivery of instruction to students has been a major concern of science educators. Adeyemi (2021) suggested the use of activity-oriented strategies such as guided-inquiry, cooperative learning, demonstration, thinks and do, and many others to ensure result-oriented biology delivery in schools. This is supported by constructivist learning theory which states that learning is an active process wherein learners are able to form new ideas based on what their current knowledge is as well as their past knowledge using their cognitive structure. Jacinta (2017) agreed with the above statement by stating that student achieve better when teachers utilize student centered strategies. This will enhance teaching of Biology in schools.

Teaching at any level of education is to bring a fundamental change in the learner (Adunola, & Kunno 2021). To facilitate the process of knowledge transmission, teachers are to apply appropriate teaching technique that best suit specific objectives and level of outcomes. Research on teaching and learning should constantly endeavors to examine the extent to which different teaching technique enhance growth in student learning (Hightower, 2018). Quite remarkably, rampant poor academic performance by the majority of students is fundamentally linked to application of ineffective teaching technique by teachers to impact knowledge to learner (Adunola, 2019). Effectiveness of teaching technique indicates that the quality of teaching is often reflected to the achievement of the learners. According to Ayeni, (2020), teaching is a process that involves bringing about desirable changes in learners to achieve

specific outcomes. Adunola (2019) maintains that teachers need to be conversant with numerous teaching methods that take recognition of the magnitude of complexity of the concepts to be covered, if teaching is to be effective. Although successful learning is influenced by several factors beyond the teacher's control, the instructional techniques and teaching method adopted by the teacher remain a crucial determinant of students' learning outcomes and academic achievement. According to Adunola (2019) Biology teacher should adopt demonstration teaching method which emphasis practical activities through demonstration.

Demonstration method involves showing, explaining, or making concepts clear through the use of examples, illustrations, and experiments. The method becomes particularly useful when students find it difficult to connect theoretical knowledge with practical application. Through direct observation of concepts, procedures, and processes, students are provided with concrete learning experiences that make learning more meaningful, easier, and more effective. When teaching Biology in secondary School, teachers are often facing various problems related on how they can make their students understand basic biological phenomena, relevant terms and their application in everyday life. In order to overcome such problems, teachers must discover and apply new teaching techniques which are compatible with the needs, interests and the abilities of students, this will equally enhance assessment of the students learning outcome.

Assessment is an important aspect of teaching and learning. It is a process by which information is obtained relatively to some known objectives or goal. Assessment is the process of gathering information to monitor progress and make educational decision if necessary (Adikwu, Aduloju & Agi, 2016). Proper assessment and supervision can provide important information that helps teachers adjust and improve their teaching skills and process. Educational assessment is a systematic process of documenting and using empirical data on the knowledge, skill, attitudes, and beliefs to refine programs and improve students' learning. It also refers to the wide variety of methods or tools that educators use to evaluate, measure, and document the academic readiness, learning process, skill acquisition or educational needs of students. Students' abilities and expected learning outcomes may not be effectively developed and properly assessed when appropriate teaching strategies are not adequately employed during instruction.

A strategy is a method or plan chosen to bring about a desired future, such as achievement of a goal or solution to a problem. It is also a method or plan chosen to bring about a desired future, such as achievement of a goal or solution to a problem. The concept of strategy has been borrowed from the military and adapted for use in business and educational aspects. A strategy is also a technique used by the teachers to help students become independent. Learning strategies include also when students independently select the appropriate method of learning and use them effectively to accomplish tasks or meet goals.

Instructional strategies are all the things the teachers use to aid the learners in their learning process; they are the means used to bring about effective teaching and learning. According to Obara and Okoh (2018), instructional strategies and materials are "all the things the teacher utilizes to interactively enhance, motivate and facilitate teaching and learning in an attempt to ensuring the achievement of a set objectives." The effectiveness of instructional materials and strategies depends upon the manner and degree to which they meet the needs of the teacher and students. Instructional strategies and materials are selected based on the principles of provision of accurate materials that will enrich and support the curriculum, taking into consideration the interest, abilities and maturity levels of the students. Teachers should be encouraged in every way to use instructional strategies as it makes learning more concrete and meaningful (Buseri &Dorgu, 2020).

Teachers need to use different instructional strategies to ensure students centered method in the classroom for creativity, innovative and critical thinking purpose in students. Classroom teaching is likely to be more effective when it is informed by an understanding of how students learn. It is therefore important that, the major implications of instructional strategies be reflected in classroom practice. In recent times, emerging research findings seem to show that instructional strategies are becoming increasingly popular in the teaching of various subjects in the secondary school level of education in Nigeria, (Osakwe, 2019).

These instructional strategies involve resolution of problems, active practice participations of learners in the teaching process and emphasis on process rather than products of learning. Some of these strategies and approaches according to Osakwe (2019) are categorized under conventional and innovative, instructional strategies which are classified under conventional are mostly those routine, well-knowing ones which teachers use predominantly. They are usually teacher-centered with little or no activities for students. These include teaching method such as lecture, story-telling, recitation and so on. On the other hand, the innovative strategies include those ones that are much more recent which are predominantly learner-centered. These include questioning, inquiry/problem solving, role-play and dramatization (Adediran, 2019).

There is no doubt that teaching strategies are necessarily tailored to the goals of the educational process; therefore this study is aimed to assess the strategies used to enhance teaching and learning of biology in senior secondary schools and to examine the extent to which these strategies can contribute to the improvement of teaching and learning.

Purpose of the study

The purpose of the study is to assess the strategies that are used to enhance the teaching and learning of Biology in Ikwuano Local Government Area of Abia State.

Specifically this study sought to:

1. find out the strategies for enhancing teaching and learning of Biology in senior secondary schools
2. find out how the teachers make use of these strategies in enhancing teaching and learning of Biology in senior secondary schools
3. To find out how students are adapting to these strategies for enhancing teaching and learning of Biology in senior secondary schools.

Research questions

1. What are the strategies to enhance teaching and learning of Biology in senior secondary schools?
2. To what extent do the teachers make use of these strategies for effective teaching and learning of Biology in senior secondary schools?
3. To what extent do the students are adapting to these strategies for effective teaching and learning of Biology in senior secondary schools?

Hypotheses

HO_1: There is no significant difference between the mean responses of teachers and students on the strategies for enhancing teaching and learning Biology in senior secondary schools.

HO_2: There is no significant difference between the mean responses of teachers and students on the use of teaching strategies for effective teaching and learning of Biology in senior secondary schools.

HO_3: There is no significant difference between the mean responses of teachers and students on the extent to which students learn and adapt to the strategies for effective teaching and learning of Biology.

METHODOLOGY

The study adopted descriptive survey design. A survey design according Ibe (2020) centers on individual and their opinions, belief, motivation and behaviour. The study was considered suitable since it solicit information from the students and teachers in senior secondary school in Ikwuano Local Government Area of Abia State. The population of the study consists of 1200 senior secondary class two (SS 11) and 15 teachers from all the public secondary schools in Ikwuano Local Government Area of Abia state. Two hundred and forty (240) students and 15 teachers from the public secondary schools in the area were selected using simple random sampling technique and census sampling technique respectively. The instrument for data collection was "assessment of strategies to enhance teaching and learning of biology questionnaire" (ASETLBQ). The instrument has two sections; A and B. Part A of the questionnaire provides information on Personal data of the respondents while part B centred on the request for the respondents which is in three clusters to complete the questionnaire meant to answer the research questions posed for the study. The questionnaire was constructed on the basis of research questions on a four-point scale, coded as follows: Strongly Agree (SA) .----4, Agree (A) ---3, Disagree ----2 and Strongly Disagree ----1.

The instrument was validated by two expertise from Biology Education and one in measurement and Evaluation all from Science Education Department, all from Michael Okpara University of Agriculture, Umudike and the reliability of the instrument was determined using Cronbach alpha technique and a reliability coefficient of 0.82 was obtained. The instrument was administered by the researcher to the Biology students and teachers in each of the selected schools and collected on the sport to enhance high return. Mean and standard deviation were used to answer the research questions while the null hypothesis was tested using independent sample t-test at 0.05 alpha level. Any mean item response above 2.5 was accepted while item below 2.5 was rejected. On the other hand, the null hypothesis for this study was accepted when the significance of P-value is $\geq$ 0.5 Alpha level and rejected when the significance of P-value is $\leq$ 0.5 Alpha level.

RESULTS

Research Question 1

What are the strategies to enhance teaching and learning of Biology in senior secondary schools?

Table 1: Mean responses of students and teachers on strategies to enhance teaching and learning of Biology in senior secondary schools

S/N	Items	Students N= 240			Teachers N= 15		
		$\bar{X}$	SD	Remark	$\bar{X}$	SD	Remark
1.	Teachers should make use of instructional materials while teaching	3.07	0.91	Agreed	3.12	1.02	Agreed
2.	Teachers should make use of active learning method to teach	3.02	0.75	Agreed	3.09	0.81	Agreed
3.	Teachers should communicate the subject content at the beginning of the lesson	2.91	0.70	Agreed	2.78	0.69	Agreed
4.	Teachers should give assignment to enhance the student	3.11	0.94	Agreed	2.98	0.70	Agreed
5.	Teachers should regularly evaluate the students to check the students progress in learning	2.99	0.90	Agreed	2.74	0.76	Agreed
	Grand mean	**3.02**	**0.84**	**Agreed**	**2.94**	**0.79**	**Agreed**

Table 1 showed that the students and teachers accepted items in table 4.1 as strategy for enhancing teaching and learning of Biology in senior secondary schools. The students had grand mean of 3.02 with standard deviation of 0.84. The teachers had grand mean of 2.94 with standard deviation of 0.79. Based on the cut-off point of 2.5 it implies that the students and teachers accepted the items as strategy for enhancing teaching and learning of Biology in senior secondary schools.

Hypothesis 1

There is no significant difference between the mean responses of teachers and students on the strategies for enhancing teaching and learning Biology in senior secondary school.

Table 2: t-test Analysis of Mean rating scores of students and teachers on the strategies for enhancing teaching and learning Biology in senior secondary school

Variables	N	$\bar{X}$	SD	Df	t-calculated	t-critical	Remark
Students	240	3.02	0.84				
				253	0.37	1.96	NS
Teachers	15	2.94	0.79				

N=Number of respondents, $\bar{X}$ = Mean, SD= Standard deviation, df= degree of freedom.

Data in table 2 showed that the calculated t- value is 0.37 and the critical t-value is 1.96 at 253 degree of freedom. The t-calculated is less than the t-critical therefore the null hypothesis stated was accepted. Since the t-calculated value is less than the t-critical value inference drawn is

that there was no significant difference in the mean rate of teachers and students on the strategies for enhancing teaching and learning Biology in senior secondary school.

Research Question Two

To what extent do the teachers make use of these strategies for effective teaching and learning of Biology in senior secondary schools?

Table 3: Mean responses of students and teachers on the extent teachers make use of strategies for effective teaching and learning of Biology in senior secondary schools

S/N	Items	Students N= 240			Teachers N= 15		
		$\bar{X}$	SD	Remark	$\bar{X}$	SD	Remark
6.	Teachers displays a list of questions on the chalkboard to get the attention of the students	3.04	0.92	Agreed	3.00	1.00	Agreed
7.	Teachers makes the students to work together to create ideas	2.87	0.89	Agreed	2.80	0.81	Agreed
8.	Teachers use visual aids in teaching the students	2.74	0.66	Agreed	2.81	0.79	Agreed
9.	Teachers distributes instructional handout such as chart to stimulate students curiosity	3.03	1.01	Agreed	2.72	0.88	Agreed
10.	Teachers respond to questions of of the students at their confusing moment	3.00	0.97	Agreed	2.98	0.81	Agreed
	Grand mean	**2.93**	**0.89**	**Agreed**	**2.86**	**0.85**	**Agreed**

Table 3 showed that the respondents accepted that teachers make use of the strategies for effective teaching and learning of biology in senior secondary schools. The items in the table had mean value above 2.5 cut-off marks set for the study and with grand mean of 2.93 and 2.86 and standard deviation of 0.89 and 0.85. Since the grand mean is above 2.5, it implies that teachers make use of the strategies for effective teaching and learning of Biology in senior secondary schools.

Hypothesis 2

There is no significant difference between the mean responses of teachers and students on the use of teaching strategies for effective teaching and learning of biology in senior secondary schools.

Table 4: t-test Analysis of Mean rating scores of students and teachers on the use of teaching strategies for effective teaching and learning of Biology in senior secondary schools

Variables	N	$\bar{X}$	SD	Df	t-calculated	t-critical	Remark
Students	240	2.93	0.89				
				253	0.30	1.96	NS
Teachers	15	2.86	0.85				

N=Number of respondents, $\bar{X}$ = Mean, SD= Standard deviation, df= degree of freedom

Data in Table 4 reveal that the calculated t- value is 0.30 and the critical t-value is 1.96 at 253 degree of freedom. The t-calculated is less than the t-critical therefore the null hypothesis stated was accepted. Since the t-calculated value is less than the t-critical value inference drawn is that there was no significant difference in the mean rating of students and teachers on use of teaching strategies for effective teaching and learning of Biology in senior secondary schools.

Research Question Three

To what extent do the students learn and adapt to these strategies for effective teaching and learning of Biology in senior secondary schools?

Table 5: Mean responses of students and teachers on extent students learn and adapt to these strategies for effective teaching and learning of Biology in senior secondary schools

S/N	Items	Students N= 240			Teachers N= 15		
		$\bar{X}$	SD	Remark	$\bar{X}$	SD	Remark
11.	The nature of the lesson delivered is one that encourages the ability of the students.	3.10	0.99	HE	2.97	0.83	HE
12.	Collaborative assignment are being given to the students.	2.78	0.82	HE	2.91	0.74	HE
13.	The subject content is communicated to the students at the beginning of the term.	3.11	0.96	HE	3.03	0.90	HE
14.	The use of instructional aids in teaching helps the students to learn.	3.01	0.90	HE	2.89	0.84	HE
15.	The students are being guided with the use of set induction when teaching.	3.04	0.88	HE	2.85	0.75	HE
	Grand mean	**3.00**	**0.91**	**HE**	**2.93**	**0.81**	**HE**

Results in table 5 showed that students and teachers accepted items in the table as extent students learn and adapt to strategies for effective teaching and learning of Biology in senior secondary schools. The items had grand mean of 3.00 and 2.93 for students and teachers respectively and standard deviation of 0.91 and 0.81 for students and teachers respectively. This implies that the respondents accepted the items to a high since the grand mean is above 2.5 cut-off point set for the study.

Hypothesis 3

There is no significant difference between the mean responses of students and teachers on the extent to which students learn and adapt to the strategies for effective teaching and learning of Biology.

Table 6: t-test Analysis of Mean rating scores of students and teachers on the extent to which students learn and adapt to the strategies for effective teaching and learning of Biology

Variables	N	$\bar{X}$	SD	Df	t-calculated	t-critical	Remark
Students	240	3.00	0.91				
				253	0.11	1.96	NS
Teachers	15	2.93	0.81				

N=Number of respondents, $\bar{X}$ = Mean, SD= Standard deviation, df= degree of freedom

Data in table 6 reveal that the calculated t- value is 0.11 and the critical t-value is 1.96 at 253 degree of freedom. The t-calculated is less than the t-critical therefore the null hypothesis stated was accepted. Since the t-calculated value is less than the t-critical value inference drawn is that there was no significant difference in the mean rating of students and teachers on the extent to which students learn and adapt to the strategies for effective teaching and learning of Biology.

Discussion of findings

The result of analysis showed students and teachers accepted that strategies to enhance teaching and learning of biology in senior secondary schools are making use of instructional materials when teaching, making use of active learning method to Teach and teachers should communicate the subject content at the beginning of the lesson among others. The corresponding hypothesis affirmed that there was no significant difference between the mean responses of teachers and students on the strategies for enhancing teaching and learning biology in senior secondary school. This finding was in line with Adediran, (2019) who under took a study on the strategies for enhancing the teaching and learning of economic in secondary schools in Ebonyi state. The result of the study revealed that appropriate methodology, adequate facilities, employment of qualified teachers, establishment of cordial relationship between parents and teachers, instructional materials, practical task and monitoring of students ability and the need for developing problem solving skill to boost students learning abilities.

The findings also showed that teachers displays a list of questions on the chalkboard to get the attention of the students, teachers makes the students to work together to create ideas and Teachers use visual aids in teaching the students to high extent. The corresponding hypothesis affirmed that there was no significant difference between the mean responses of teachers and students on the use of teaching strategies for effective teaching and learning of biology in senior secondary schools. This finding agreed with the view (Ibe, 2020) whose theory argues that it is impractical for teachers to make all the current decisions and dump the information to students without involving students in the decision process as well as assessing students' ability to construct knowledge.

The result further showed that students and teachers accepted that the nature of the lesson delivered is one that encourage the ability of the students, Collaborative assignment are being given to the students and the use of instructional aids in teaching helps the students to learn among others to high extent were strategies adapted for effective teaching and learning of biology in senior secondary schools. The corresponding hypothesis affirmed that there was

no significant difference between the mean responses of students and teachers on the extent to which students learn and adapt to the strategies for effective teaching and learning of biology. This finding was in line with Burseri and Dorgu, (2020), who under took a study on the strategies for enhancing the teaching and learning of economic in secondary schools in Ebonyi state and reported that students and teachers have adapted to teaching innovative but the requisite resource needed to use in teaching in line with the new teaching strategies are not readily available.

CONCLUSION

Great emphasis should be made on instructional materials and monitoring of student's ability, to boost students learning and teaching of biology in secondary schools. The adequate use of instructional materials by the teachers facilitates learning environment. It gives the students full concentration and pay attention in class. This study recognized that Biology studies in secondary schools would result to biology literate citizens who can apply the theory and practical's of the knowledge of biology in the society.

RECOMMENDATIONS

From the findings gotten from the analysis of the data, the researcher made the following recommendations:

1. Teachers should be trained on best way of teaching Biology with appropriate strategies to enhance teaching and learning.
2. Workshop and seminar should be organized by the science teachers association of Nigeria on area of strategies in teaching and learning of Biology.
3. Teachers who should teach Biology studies should be expertise in the field and registered teachers. Teachers registration council of Nigeria should sit up on their duty to ensure that is only expertise in the field should be allowed to teach Biology.

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Impacts of Artificial Intelligence on Technical and Vocational Education and Training Programmes: Challenges and Prospects

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Abstract

Technical and Vocational Education and Training (TVET) constitute a fundamental mechanism for developing the skilled workforce required for sustainable of economic growth. The advent of Artificial Intelligence (AI) has introduced transformative opportunities and complexities into the design and delivery of TVET programs. This paper presents a critical analysis of the impact of AI on TVET with a focus on pedagogical innovation, skill acquisition, and alignment with contemporary labour market demands. The discussion delineates the affordances and adaptive learning environment, intelligent tutoring system, automated assessment and simulation – based training that replicate industrial processes. These technologies facilitate individualized instruction, and provide data-driven insights that support instructional improvement and institutional decision-making. However, the integration of AI into TVET is constrained by several systematic challenges. These include insufficient digital infrastructure, limited educator capacity in AI literacy and integration, financial constraints, concerns regarding data privacy and algorithmic bias and disparities in access between urban and rural institutions. Additionally, the lack of cohesive policy frameworks, and weak linkage between educational institutions and industry impede the effective alignment of curricular with technological advancements. To address these challenges the paper proposes a strategic pathway comprising targeted investment in teacher professional development, the establishment of smart laboratories and IOT- enabled training facilities, the cultivation of public – private partnership and the formulation of regulatory frameworks that promote equitable and ethical development of AI. Such measures are imperative for leveraging AI to strengthen the relevance, quality and inclusiveness of TVET in the context of the Fourth Industrial Revolution.

Keywords: Artificial Intelligence, Impact, Education, Training, Challenges, Prospects.

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INTRODUCTION

Artificial Intelligence or (AI) technology has been a topic growing interest and investigation in various field higher education inclusive. At present Artificial Intelligence technology has not only changed people's lifestyles but has also changed how people work, learn, and interact. According to Sart and FiHra (2021) the emergence of Artificial Intelligence has made it possible for various kinds of innovation to appear all the time, making human activities and work more practical and effective. Similarly, Kham and Richer (2020) posited that the development of Artificial Intelligence has also penetrated the world of education as it allows people to learn with the help of education assistants such as robots. The development of Artificial Intelligence at present requires the world of education to adopt to it in order to improve the quality of education at all levels.

According to Canbel and Zhang (2023) Artificial Intelligence (AI) represents transformative shift in the technological landscape, impacting on various sectors education inclusive. The advent of AI has opened new frontiers in the way knowledge and skills are impacted and acquired particularly in Technical and Vocational Education and Training

(TVET). As one of the educational systems in Nigeria that is primarily connected with equipping of individuals with specific skills and competences essential for the labour market, the integration of Artificial Intelligence into Technical and Vocational Education and Training programme curriculum in Nigeria at this period that the awareness on the use of technology such as AI globally is beginning to attract much attention. According to Mahama and Rexford (2019) Artificial Intelligence has the potential to revolutionalize education by personalizing teaching method to suit individual students needs, provide prompt feedback during teaching and learning process that will help. Individual has to acquire sound knowledge and skills for readiness into the world of work.

The world Economic Forum cited in Hawang and Long (2022) notes that the future of work will significantly be shared by Artificial Intelligence and automation technology is properly utilized in educational programme. As industries increasingly adopt Artificial Intelligence driven process, the demand for skilled workers who are proficient in technical and vocational skills is on the rise (Prinsho, 2021). Thus, there is urgent need for the integration of Artificial Intelligence in Technical and Vocational Education and Training programme curriculum in Nigeria as to ensure that educational curriculum of Technical and Vocational Education and Training programme remains relevant and aligned with the evolving needs of labour market which Technical and Vocational Education and Training Programme in Nigeria can offer to individual who will be willing to run programme in any of the specialized areas in Technical and Vocational Education and Training.

Concept of Technical and Vocational Education and Training (TVET)

Technical and Vocational Education and Training (TVET) according to Anaele (2023) refers to educational programmes and courses that equip individuals with practical skills, knowledge and competences necessary for specific trades, industries or professions. Technical and Vocational Education and Training as defined by UNESCO and adopted by Federal Republic of Nigeria (FRN, 2013) in her National Policy on Education is used as a comprehensive term referring to those aspect of educational process involving in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitude, understanding and knowledge relating to occupation in various sectors of economic and social life.

Technical and Vocational Education and Training (TVET) according to Onwurah and Ejims (2019) is a programme that focuses on hand-on, realworld applications, preparing learners for direct entry into the workforce. TVET encompasses a diverse range of fields, including but not limited to Building trades, Automobile trades, Mechanical trades, Electrical/Electronic trades, Wood Work trades. In Nigeria TVET is a critical component of the educational system aimed at equipping individuals with practical skills and knowledge relevant to specific industries and trades.

Goals of Technical and Vocational Education and Training (TVET) in Nigeria

Technical and Vocational Education and Training (TVET) as enshrined in the National Policy on Education is concerned with qualitative technological human resources development directed towards a national pool of skilled and self –reliant craftsmen, technicians and technologist in technical and vocational fields that can contribute effectively to the socio-economic development of Nigeria. The goals of TVET according to Federal Republic of Nigeria (2013) shall be to:

1. provide the trained manpower in the applied science, technology and business particularly at craft, advance craft and technical level,
2. provide the technical skills necessary for agricultural, commercial and economic development, and
3. give training impact the necessary skills to individual for self-reliance economically.

The above stated goals of TVET as intended to make Technical and Vocational Education and Training proramme more practical functional and job oriented requires full integration of technology in teaching and learning process. Such technology according to Fittra and Hayanto (2023) include Artificial Intelligence that has become a vital part of the virtual world that is capable of helping human learn better and achieve educational goals more effectively.

Concept of Artificial Intelligence (AI)

Artificial Intelligence (AI) is a vast branch of computer science concerned with developing intelligent computer capable of doing tasks that typically need human intelligence. According to Alexa (2019) Artificial Intelligence is the process of modeling human thinking and designing a machine so that it can behave like humans or other terms called cognitive tasks, namely how machine can learn automatically from programmed data and information. Artificial Intelligence can also be interpreted as Artificial Intelligence or AI. Similarly, Klamma (2023) stated that Artificial Intelligence is one part of computer science that makes machines such as computer able to do work and as well as human do (Klamma, 2023). In the same vein, Oblinger (2021) posited that Artificial Intelligence (AI) is a technology whose machines can learn and understand logic like humans. This technology the author continued is said to be able to help simplicity human life which is very complex. According to Howe and Rau (2024) Artificial Intelligence in the development of computer systems that can perform tasks that typically required human intelligence such as learning, problem-solving, reasoning, and perception.

History of Artificial Intelligence (AI)

To disclose on the terms "Artificial Intelligence" it is necessary to discuss on the history of Artificial Intelligence for the purpose of sound knowledge or idea about the emergence of Artificial Intelligence. To achieve this purpose it is necessary to go back to previous dates. According to Mila (2018) in the Ancient Greek period, it is proven that various ideas about humanoid robot have been carried out. An example of this, is Daedbus who said to have ruled the mythology of the wind to try to create Artificial humans, modern artificial intelligence has began to be seen in history with the aim of defining philosophers' system of human thought. The year 1884 is important for artificial intelligence. On this date Charles Babbase was the one who worked on a mechanical machine that will exhibit intelligent behavior.

However, as a result of these studies carried out by Babbase in 1884, he decided that he would not be able to produce a machine that would exhibit as intelligent behavior as a human being, he therefore suspended his work. In the year 1950 Claude Shannan introduced the idea that computers could play chess, he therefore stated work on artificial intelligence from history officially dates back to 1956. In the year 1956, a conference artificial intelligence session at Dartmouth College was introduced for the first time. A man called Marvin Minsky was the one who started in his book "stormed search for Artificial Intelligence" that "the problem of artificial intelligence modeling within a generation will be solved". The first artificial intelligence application were introduced during the period. These applications are based on logic theorems and chess game. The programmes developed during this period in question were

distinguished from the geometric forms used in the intelligence tables; which has led to the idea that intelligent computers can be created.

Artificial Intelligence began to be used in large projects with practical application in the 1980s. The next time the daylight is passeu, the artificial intelligence has been adopted to solve real life problems. Even when the needs of users are already met with traditional methods, the use of artificial intelligence has reached to a much wider range which continue to improve up till date all over the globe. In the field of Education the use of Artificial Intelligence can be traced back to the 1970s when LOGO programme and Turtle robots were introduce to young learners. However, those tools focused more on computational thinking of programming concepts instead of AI. In 1996, a book named "Artificial Intelligence: A Modern Approach" was published and considered the most standard textbook in the field of AI for computer science undergraduates (Norvig and Russel, 2024).

Artificial Intelligence Application in TVET Programme

There are several application of Artificial Intelligence in technical and vocational education and training (TVET). These applications include content design, delivery of lesson, assessment, feedback, and support. In terms of content design (Kuleto & Elevian, 2022), Artificial Intelligence can enable someone in the designing of content which is friendly and flexible. In the same vein Miao and Sylva (2018) posited that Artificial Intelligence algorithms can scan large data to tap into the gaps thus creating content that is interesting and friendly to users. In educational programming such as in TVET AI can also be used for making content including textbooks, personalized learning materials, and interactive courses according to the target audience. Artificial Intelligence tools also enable the development of educational materials that is based on national language processing capabilities, thus ensuring material that is consistent, concise, and grammatically correct (Dasky, 2021).

In educational programmes, in terms of delivery of content AI usually enables delivery of contents more efficiently and flexible by substituting classroom instruction and providing support for students to learn from anywhere in the world at any given time. In the classroom teaching and learning process AI system have a high capability to analyze multiple sources of data and compare those data to known partering. They can also recognize the source of problems and give audience to lecturers to achieve more consistent outcomes across various classes during teaching and learning period. In other words, the AI and teachers can work together to create the best delivery method for students with maximum positive outcomes. The benefit of using AI for delivery of education content include the provision of individualize and customized learning and universal access for all students who may speak different language or have some disability such as visual or hearing impairment (Jeff and George, 2021).

In terms of assessment in education, Artificial Intelligence can enable automated assessment (Lee and Mishra, 2021). For example, AI can automate grading homeworks and test using a significant amount of time. This time could be used to work on professional development, interact with students, and prepare for class. AI can be used by tutors to personalized assessment and provide timely feedback addressing individual learning needs. The benefit of AI in assessment in education is that it can reduce human subjectivity and time for assessment. Singer and Mark (2021) suggest that AI use in education assessment increases consistency, personalization, and stability.

Impacts of Artificial Intelligence on TVET Programmes

Artificial Intelligence (AI) has emerged as a pivotal focus in transforming global systems,with education being significantly impacted. As a field traditionally reliant on human interaction and subjective judgment, education is experiencing a paradigm shift due to AI's increasing role in automating, individualizing, and scaling learning processes. Tools ranging from adaptive learning platforms to predictive analytics and automated administrative systems now permeate classroom and institutions.

At present AI holds the promise of revolutionalizing teaching and learning by improving education outcomes, enhancing access, and reducing operational burdens. Nonetheless, the adoption of Ai is not without critical concerns. These include questions of algorithmic farness, data privacy, teacher de-professionalization, and a potential overemphasis on quantifiable outcomes at he expense of humanistic education values. Inspite of all these facts AI has been reported by many scholars as a transformative force that have played positive impact on education. Some of the impacts of on education as outlined by Binns and Pane (2020) include:

1. **Enhancement of Education Programme**
   Intelligent Tutoring Systems and Automation Intelligent Tutoring System (ITS) are another crucial innovation in Artificial Intelligence –enhanced education. These systems exemplified by platforms such as squirrel AI, Century Tech, and IBM's Watson Tutor, emulate the guidance of a human tutor by offering real-time, targeted feedback based on a student's individual responses. Research has demonstrated that Intelligent Tutoring systems can deliver learning gains equivalent to one-on-one human tutoring under certain conditions.
   Again, AI streamlines administrative functions, including attendance monitoring, grading, course planning and even plagiarism detection in academic work. In education automating these labor-intensive tasks allows educators to focus more on mentorship, curriculum development, and classroom instruction.
2. **Equity and Access**
   A key promise of Artificial Intelligence in education lies in its potential to expand access to learning for underrepresented population. AI-powered platform like Duclingo, Coursera, and Khan Academy offer scalable learning solutions that can reach remote and underserved communities. Moreover, tools for real-time transition and speech recognition support learners with linguistic or physical disabilities, creating more inclusive environment.
   The deployment of AI in education assures basic digital infrastructure, stable internet connectivity, and digital literacy-resources often unavailable in low-income or rural regions. Even where technology is accessible, inequalities in low students use of AI tools (e.g for enrichment vs remendiation) may exacerbate education disparities rather than close them.
3. **Enhancing Personalized Learning**
   Artificial Intelligence's transformative contribution to education arguably lies in its ability to support personalized learning. Traditional classroom setting, structured around standard curricula and uniform pacing, often fail to accommodate the diverse abilities, learning styles, and backgrounds of students. AI-driven educational technologies such as DreamBox learning, Carnegie Learning, and Knewton use of algorithms to adjust instructional content in real-time based on a student's performance, offering an adaptive learning experience that is continuously refined. This form of individualized learning offered by AI can significantly increase engagement, motivation, and retention,

especially for students with learning disabilities or those in under-resourced schools. However, personalization through AI comes with caveats, critics have argue that the very logic of algorithmic personalization may narrow than expand learning opportunities. AI systems tend to optimize for measurable outcomes, often reinforcing patterns of behavior rather than changing students with diverse cognitive tasks.

4. **Data-Driven Decision Making**
   Artificial Intelligence driven learning analytics enable educational institutions to collect, analyze, and interpret vast quantities of data, allowing for predictive insight and informed interventions. By tracking metrics such as engagement, attendance, and assessment outcomes, these systems can identify students at risk of failing, suggest timely interventions, and customize pedagogical strategies. Predictive capacity through AI enhances institutional efficiency and students success. Predictive analytics can also foster deterministic assumption about student potential, subtly encouraging tracking and stratification.
5. **Enhanced Student Engagement**
   Artificial Intelligence – powered interactive learning experiences, such as gamification and simulations that can enhance student engagement and motivation during teaching and learning process. It can also provide virtual learning environments that can provide immersive and interactive learning experiences during teaching and learning process.
6. **Teacher Support**
   Artificial Intelligence can augment teacher capabilities, freeing up time for more critical aspects of teaching. It can also provide teachers with personalized professionalized professional development opportunities.

Challenges of Using Artificial Intelligence in TVET Programmes

As in any human activity there are challenges to realisation of the goals of using Artificial Intelligence as expected. Among these challenges includes;

1. **Digital Divide and Equity Issues**
   While Artificial Intelligence promises personalization, its benefits are not universally accessible. The digital divide – a gap in access to digital tools and the internet remains a persistent problem, particularly in low-income regions and among disadvantaged students. According to UNESCO cited in Eubanks (2019), disparities in digital infrastructure and teacher training significantly hinder the effective use of AI in educational inequality rather than bridge it unless systematic investments are made in equitable infrastructure to correct this problem.
2. **Technical and Implementation Challenges**
   Implementing Artificial Intelligence in education requires robust infrastructure, continuous technical support, and significant financial investment. Many educational institutions, particularly in the Global South, lack the capacity to adopt and maintain AI systems. Moreover, the efficacy of AI tools depends on continuous algorithmic updates, system integration, and real-time data analytic all of which present logical challenges (Luckin, 2023). There is also a need for interdisciplinary collaboration among educators, data scientists, and policy makers which is often lacking.
3. **Data Privacy and Ethical Concerns**
   One of the foremost challenges facing the use of Artificial Intelligence in education is the ethical management of student data. AI systems rely heavily on large data sets to function effectively. In educational context, this means collecting sensitive student information academic performance, behavioural patterns, and even biometric data. The potential for

misuse, data breaches, or surveillance raises serious concerns. According to Bruno and Slaver (2024), the use of learning analytics must be guided by ethical frameworks to prevent exploitation and ensure transparency. However, in many context, such frameworks are either lacking or insufficiently enforced.

Moreover, Artificial Intelligence can reflect or amplify existing biases embedded in the training data. This is particularly critical in education, where biased algorithms may disproportionately disadvantage already marginalized groups, exacerbating inequality.

4. **Teacher Resistance and Professional Displacement**

Many educators are apprehensive about the integration of Artificial Intelligence, fearing job displacement or the devaluation of their professional expertise. While proponents arue that AI can augment teachers by taking over administrative tasks, the rapid pace of technological change can create anxiety and resistance among educators, especially in systems where professional development is inadequate. As Charls and Morgan (2021) highlight, the teacher's role must be re-imagined in a way that positions them as co-designers and facilitators, not mere implementers of AI Systems.

5. **Lack of Human Interaction and Emotional Intelligence**

Artificial Intelligence lacks the detailed emotional intelligence and empathy that human educators bring to the classroom. Education is not merely about knowledge transmission; it also involves mentorship, motivation, and socio-emotional development. As Lukeman (2018) argues, AI may support teachers but cannot replace the relationship aspects of teaching that are central to students success. Over-reliance on AI tools risks reducing education to a mechanistic process devoid of human affection and contextual understanding.

6. **Pedagogical Misalignment**

Artificial Intelligence applications often adopt a "one-size-fits-all" model of learning, which may conflict with constructive or student-centred pedagogies. For instance, intelligent tutoring systems are typically designed around behaviourist models that reward correct answers without fostering critical thinking or creativity (Jones and Lia, 2023). This raises questions about whether AI can truly enhance learning outcomes or merely optimize existing potentially outdated educational practices.

7. **Ethical and Pedagogical Concerns**

Artificial Intelligence's integration into education provokes deeper philosophical and ethical inquires. One major concern is algorithmic bias – when systems unintentionally reproduce discriminatory outcomes due to skewed or incomplete training data. Such bias can lead to inequitable access, unfair assessment, and harmful profiting, particularly among students from minority or disadvantaged backgrounds.

Moreover, the pedagogical shift toward AI- driven instruction may reduce education to a transactional exchange of information. Human qualities central to learning-empathy, creativity, dialogue, moral reasoning are difficult to encode into algorithms. AI system lack the contextual judgment that teachers apply when addressing diverse classroom dynamics, behavioural nuances, and emotional needs.

Prospects of Artificial Intelligence on TVET Programme

Artificial Intelligence (AI) in education has several prospects that can enhance the learning experience for students and improve teachers' productivity. Some of the prospects of AI as outlined by Prinsho (2021) include;

1. **Tailored Learning Experience:** Artificial Intelligence can help create tailored learning experience for students, catering to their individual needs and abilities. This can lead to

improved student outcomes and increased engagement during teaching and learning process.

2. **Adaptive Assessment:** AI-powered assessment can adapt to students knowledge and skills during their training period in the school providing them with a more accurate measure of their abilities.
3. **One-on-one Support:** The use of AI in teaching and learning in Technical and Vocational Education and Training (TVET) programme can power tutoring system which will in turn provide one-on-one support to students, offering real-time feedback and guidance to the students.
4. **Automated Grading:** The use of AI in teaching and learning process can automate grading, freeing up teachers to focus on more critical aspects of teaching tasks.
5. **Inclusive Education:** AI-powered tools can help to make education more inclusive, providing support for students with disabilities and language barriers.
6. **Accessibility Features:** AI-powered features, such as text-to-speech and speech-to-text, can enhance accessibility for students with disabilities.
7. **Impaired Efficiency:** AI can automate administrative tasks in TVET programme such as attendance tracking and grading, freeing up teachers to focus on teaching. AI can also analyze large datasets, providing insights that can inform teaching practices and improve students outcomes.
8. **Future Education:** AI may charge the role of teachers, shifting their focus from traditional teaching to more facilitative and mentorship roles. AI may also enable new learning models, such as virtual and augmented reality, that can enhance student engagement and learning outcomes during teaching and learning process.

CONCLUSION

The conceptual paper discusses Artificial Intelligence and its impacts on TVET programmes: challenges and prospects. The review of previous studies shows that while AI holds transformative potential in education, its usage in educational field is accompanied by substantial challenges that must be critically addressed. Ethical concerns, pedagogical misalignment, equity gaps, and infrastructural limitations all hinder the seamless utilization of AI in educational field. Rather than a wholesale replacement of traditional education, a hybrid model that combines human pedagogical strengths with AI capabilities underpinned by rigorous ethical and policy framework, is essential for meaningful education innovation that can help in achieving education objective through Artificial Intelligence usage in education.

RECOMMENDATIONS

To tackle the challenges affecting Artificial Intelligence Application in TVET programmes, the following are some measure that could be put in place;

1. Technology such as robotics should be embraced holistically in technical training institution offering programme in TVET in order to complement the service of teachers.
2. Government should ensure that regular workshop programme are organized for teachers on the use of technologies.
3. Government and policy maker in education should ensure that the use of Artificial Intelligence in teaching and learning be enshrined into educational curriculum in Nigeria.
4. Government should ensure that teachers are regularly sponsored for further training on the use of technology such as Artificial Intelligence.

5. Adequate sensitization programme should be sponsored and organized by the government for teachers as to create awareness to them on the importance of technology in educational field.

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Blockchain Technology in Education Management Information System: Concepts, Basic Terminologies and Emerging Potentials

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Abstract

Blockchain technology has moved beyond its origins in digital currencies to become a transformative tool across diverse sectors, including education. It offers unique opportunities for managing, securing, and sharing information. Within the educational setting, these attributes present innovative pathways for addressing long-standing challenges related to record keeping, credential verification, data integrity, and trust in institutional process. The system operates in ways that once a transaction has been effected and registered by the block, it becomes very difficult to change or temper with. Exploring the Blockchain Technology innovation in the area of education management information system would enhance better performance of the system. The paper argued that the Blockchain Technology (BT) being decentralised, was designed to prevent monopoly of decision making. It uses a peer to peer (P2P) network where everyone is allowed to partake. It was argued that if anyone creates a new block, every participant in the block should agree with the transaction within the block chain to be considered valid. If any transaction goes off contemplation, the entire block is invalidated, thus rejecting the transaction. The terminology explained includes the peer to peer, cryptography, proof of work, consensus algorithm, punishment and rewards as used in Blockchain. The emerging potentials of the Blockchain technology in education management information system were discussed while suggestions such as a close study of existing university use cases should be done with a view to importing valuable lessons into the global education management information system.

Keywords: Blockchain Technology, Education Management information system, Credential Verification, Data Integrity, Decentralization.

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INTRODUCTION

The global education system is undergoing a transformation tinting toward the exploration of technology to its advantage. An emerging technology which possesses certain potentials for educational management springing out from the Information and Communication Technology is the Blockchain Technology (BT), which could make education management information system more secured. BT has moved beyond its origins in digital finance to become a transformative tool across diverse sectors, including education. Characterized by decentralization, transparency, and immutability, BT offers unique opportunities for managing, securing, and sharing information. Within the educational domain, these attributes present innovative pathways for addressing long-standing challenges related to record keeping, credential verification, data integrity, and trust in institutional process.

The conceptual foundations of blockchain distributed ledgers, consensus mechanisms and cryptographic security- provide a framework for rethinking how education management information is stored and exchanged. At the same time, a growing body of scholarship highlights the emerging potentials of BT in enhancing efficiency, reducing fraud, and empowering learners with greater control over their academic records. This dual focus on foundational understanding and forward-looking applications underscores the importance of

exploring Blockchain not only as a technical innovation but also as a strategic enabler for a more transparent system.

In Nigeria, the exploration of the BT is being popularized by the Federal Ministry of Communication and Digital Economy (FM&DE) which recognized its importance in accelerating national development. According to Section 4:2 sub-section 7 of the National Blockchain Policy for Nigeria; The Government encourages the adoption of Blockchain Technology in various sectors such as healthcare, finance, education and logistics. It is expected that Blockchain Technology will drive innovation and economic growth in the country (FM&DE: 2023:20). Through technological adoption in education, it is believed that nations, institutions and individuals can benefit from easier and more productive operation. Hence, the National Blockchain Policy for Nigeria emphasized the Triple Helix Model (THM) which encourages collaboration between the University (academia), Industry (Business), and the government. The catalyst effect of such synergy is for overall national development.

The Blockchain Technology was popularised via its adoption in Cryptocurrencies Digital Assets which has been dangled as a Decentralized Finance (DeFi). Proponents believe Blockchain Technology would become more popular in the Web3 (next generation of the internet), Non-fungible Tokens (NFT) and Decentralized Autonomous Organization (DAO) etc. There is a consensus among stakeholders that its adoption in education management information could enhance transparency in academic records (Adeboye, 2019, Koshiry , 2023). Educational management information system (EMIS) has been described as a database aimed at ensuring accurate, appropriate and timely education data and information available to make necessary educational decisions (Ogunsola 2022). Education Management Information System functions in data collection, storage and retrieval in education institutions at all levels for operational improvement. This paper therefore would attempt to conceptualize the term blockchain Technology, discuss some common terminologies associated with the technology and would explore the emerging potentials of the Blockchain Technology in Education management information system.

Concept of the Blockchain Technology

A Blockchain consists of different chains of blocks interlocked in chain-like structure. It was originally intended as a Cryptocurrency but its popularity increased as the technology addressed other classical problems for the centralized system (Alsaadi & Bamasoud, 2023). In 2009 a Cryptocurrency in the name of Bitcoin was built using the blockchain under the pseudonym -Satochi Nakamoto. A blockchain is a distributed ledger open to as many persons interested in participating in the block. Its properties should guarantee security of data, accountability and stakeholders' participation. Johnson et al (2023) opined that the blockchain-distributive element in contrast to the already existing accounting digital tool updates stakeholders on each transaction as they happen. Registration in a blockchain is very difficult to change or temper with. Ruhlow (2021) defined blockchain technology as a particular type of digital database that is used to store a large amount of information in blocks. Koshiry et al (2023) defined the blockchain as a distributed digital ledger that records transactions in a secure, transparent, and tamper-proof manner.

Blockchain Technology (BT) could assist in educational management in keeping valuable data secured, reliable and temper-proof. The challenges of Information Communication Technology in education includes poor backup architecture occasioned by databases prone to cyber-attacks, cyber security threat and data irretrievability. It is expected that Blockchain Technology (BT) would minimize observed shortcomings. Fig i explains the

conceptual outlook of the framework and design of the Blockchain technology that enhances security of data and effective operation in education management information system. Transactions made in a blockchain are registered, secured and temper-proof which prevents it from manipulations.

Fig i: Conceptual framework of Blockchain Technology in educational planning. **Source:** Authors' Design

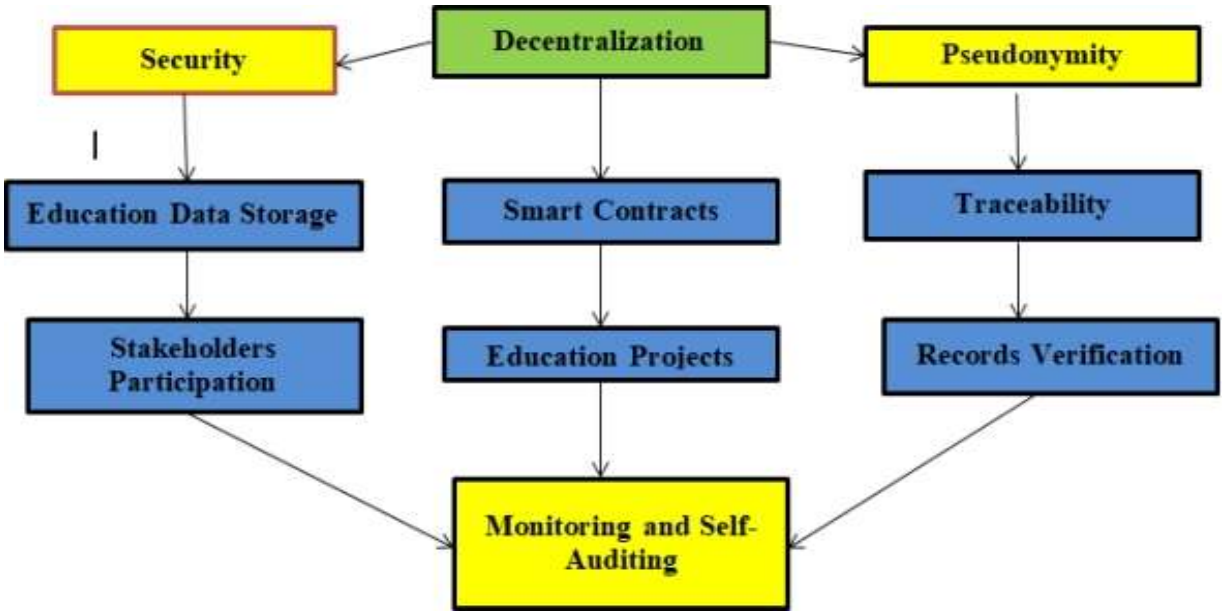


Fig i shows that Blockchain Technology could enhance education management information system. Decentralization as seen in fig i explains the unique nature of the Blockchain system.

Bureaucracy often times acts as gatekeepers to education progress because bureaucratic decision making is slow. According to Imakpokpomwan (2015), some major decisions affecting education are handled within political circles thereby allowing politics to override professional considerations. The centralized nature of government and the attendant consequence of red-tapism in influencing policy making and implementation could create room for data manipulation.

The Blockchain Technology (BT) is decentralized and designed to prevent monopoly of decision making. Decentralization within the blockchain system promotes education data integrity, smart contracts, education projects execution as all stakeholders have a stake, a voting right and real-time monitoring of education valuables. The Transactions in a blockchain is Pseudonymous which is in contrast with the term "anonymous". This allows for traceability without revealing the personal details of the personalities involved. Monitoring & Self-Auditing as seen in fig i demonstrates how the Blockchain Technology enables a self-auditing protocol. This is possible because it is an immutable ledger of records with a consensus mechanism that validates transactions in a transparent manner. The education system operating within the Blockchain incorporation would create a real-time monitoring of educational activities, improved accuracy with a well-managed risk and automated compliance. The self-auditing capability of the blockchain enhances transparency, accountability and credibility.

Blockchain Technology and its Operational Efficiency in Education

A Block contains three (3) important properties and they are namely: Data, Hash and Previous Hash. The Hash can take the form of a finger print, an address in a complex mix-up of letters, numbers and characters (e.g. e2gcbtFr2444Db3). Once a hash is created for the first time, it is called a genesis block with its unique identification. However, if a change is made, it causes something to change within the block making it markedly different from the genesis block, providing the awareness of a change to all participates in the network in the blocks or node.

Fig ii. Chain-like description of a Blockchain network. Source: Author's design

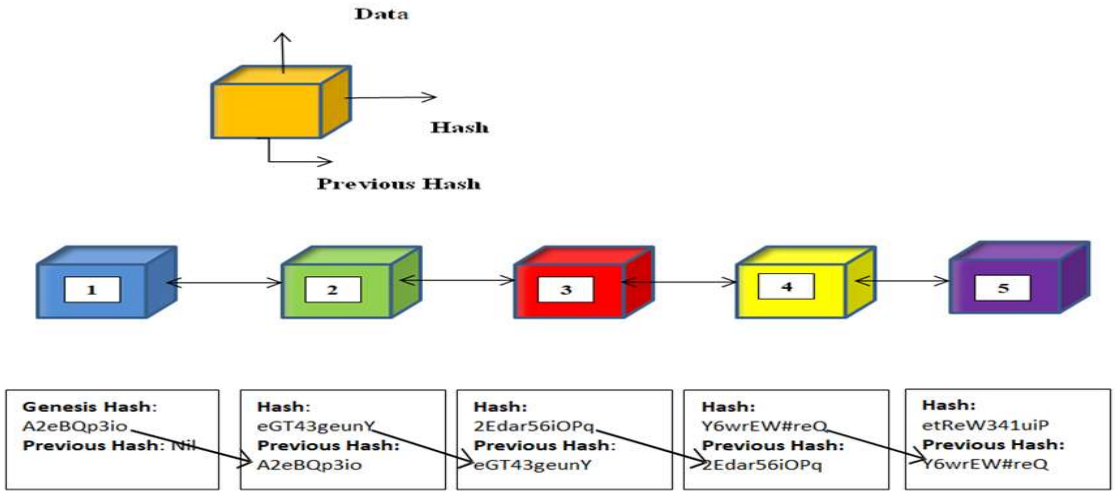


Fig ii gives a description of this concept explaining the phenomenon surrounding blockchain operation. As stated earlier, the blocks forms a chain-like structure, as the participant expands the blocks continue to build and link into one another with every block carrying its own unique information open to everyone in the nodes. Every record is immutable and secured in a blockchain system, thus, the information stored within it is temper-proof and can survive any form of attack from hackers. According to Alsaadi & Basamoud (2023), Cryptocurrency hash function is an integral part of the blockchain technology innovation. It is the main characteristics that give security capabilities to the processed transactions and making it immutable.

As shown in Fig ii, each of the blocks is interconnected with a unique identifier on the previous block known as a "hash" except for block number 1 known as the "Genesis Block". If block number 4 is tempered with, block number 3, 2, 1 will be invalidated while block number 5 will signal that "something is not right". There is a property that enables security of information registered on all blocks; it is called the Proof-of-Work (PoW). The Proof- Of-Work (PoW) is a consensus mechanism that slows down the creation of new blocks. It makes it difficult for the creation of new blocks and if for any reason a new block is created, same energy will be required to re-create or alter previously created blocks. Another way this works in making the blockchain temper-proof is that it is distributed and has no centralized control or authority base. It uses a peer to peer (P2P) network and everyone is allowed to partake. If a new person joins, he or she gets a full copy of the entire blockchain. If anyone creates a new block, the block is sent to everyone in the network. Every participants agrees (i.e. have a consensus) on what nodes and transaction within the block chain is considered valid and if any transaction goes off contemplation, the entire block invalidates or rejects the transaction. Alteration can only take place if the Proof-Of-Work is done for all the nodes or blocks within

the blockchain and every participants agree to it. This requires a dint of hard work making it near impracticable to achieve.

Data management in the blockchain works like registration approved in the book industry. For instance, a particular published journal or book has its unique International Standard Serial Number (ISSN) or International Standard Book Number (ISBN) respectively kept by the publishing company. Whenever the need to verify the authenticity emanates, one would look up to the relevant authority for confirmation. One common trait with the issuing body or the custodian of the assets mentioned is that they are centralized, that is having a central authority that issue and validates the information. The centralized nature could sometimes be manipulated and to prevent the forgoing, a decentralized platform like the Blockchain Technology (BT) will bring about the solution in the operations of the system. It is believed that decentralization reduces the risk of falsifying records, manipulation and corruption in the systems. Blockchain Technology (BT) by its characteristic, is opposed to centralization which encourages all round participation in the system, thereby reducing falsification or manipulation of data.

Terminologies Associated with the Blockchain Technology

Blockchain, though an emerging technology, has terms that make the understanding of its working system comprehensible. Some of them are presented as follows;

- **Peer to Peer (2P2):** This implies networks of computer consisting of nodes equally open to everyone to be involved. It operates in a two-way secured fashion.
- **Cryptography:** This is the art of secure communication in an environment considered hostile. Cryptography is needed for security reasons because every participant in the network or nodes can communicate including bad actors (hackers). Blockchains trust comes naturally with the network community because it provides cryptographic proof over a set of transaction (Alsaadi & Basamoud, 2023).
- **Consensus algorithm:** This means "the rule". Every node in the network has a predefined protocol it follows to create newer blocks or transaction within the blockchain. Hence, for a new block to be created, it must first meet the required condition of the established protocol. There are four (4) basic types of consensus algorithm which are: (i) **Proof-Of-Work**: This is a consensus rule in which actors within the blockchain can create new blocks by expending significant amount of computational power. This process is quiet rigorous, hence guaranteeing a temper proof security within the network. (ii) **Proof-Of-Importance**: This is an algorithm or consensus rule that determines the likelihood of an account being chosen for validation of transaction and creating new blocks for quality transactions that strengthen the entire blockchain network. (iii) **Proof-Of-Activity**: This is a consensus algorithm that combines Proof of Work (PoW) and Proof of Stake (PoS). It leverages on the strength of Proof of Work (PoW) and Proof of Stake (PoS) to reduce energy consumption in the system. (iv) **Proof-Of-Stake**: This is a consensus algorithm in the blockchain that allows validators to create new blocks without expending more computational power.
- **Punishment and rewards:** This derived from the games theory; it ensures that it will be in people's best interest to always follow the rules established. This is prevalent in FinTech (Financial Technology) where participants are rewarded (giving tokens) for following the rules and otherwise punished (deducting tokens) for disobedience to the rule. Strehle (2020) identified two types of Blockchain; as-public and private blockchain networks.

➢ **Public - Open Blockchain**: The Public Blockchain allows for public participation, it has no third party, but borderless, neutral, and temper-proof and opens to everyone. It has a

binary protocol of "valid" and "not valid". In other words there's nothing like good, bad, legal or illegal. Public blockchain is immutable and has no single point of failure; records cannot be removed or prevented from being published as long as the consensus algorithm prevails.

- **Private - Closed Blockchain**: It is limited by authorized participants and it doesn't really bespeak of Blockchain in the real sense because the whole idea of a blockchain is to ensure decentralization, but the private closed blockchain demonstrates the contrary.

The potentials of Blockchain Technology in Education Management Information System

Education sector is data-driven; records are stored, managed and retrieved for planning and other managerial purposes. Educational Planners have often time been confronted with the issues of reliability of data, where available, when planning the education system. Agboola, & Imakpokpomwan, (2011), cautioned that availability of accurate data is the hallmark for projection and once data are unreliable, the projections based on them are bound to be faulty. Fraud in data can also render the education sector less predictive including rise in credibility issues. Blockchain Technology can assist in the following ways;

- **Validation of Data:** In the developing world where access to academic records are not yet automated, accessing credentials, academic records and the validation of transcripts are mostly done through a manual process in a traditional method which could be porous, prone to social misdemeanor and could create room for fraudulent activities (Abdulrauf et al., 2024). Falsified certificates are deliberately designed to mislead and may be product of credential racketeering (Adebayo, 2024). Another issue associated with traditional methods includes possession of unverified certificates which borders on lack of authentication (Nwachukwu, 2024). These leakages in EMIS could be eliminated by the application of the blockchain technology.
- **Records Manipulations**: Intellectual theft, population and students' enrolment data manipulation has become a threat to the education system. Once education data are compromised, the integrity of its outcome becomes questionable because inaccurate data leads to wrong conclusions. It is more expensive to handle forged certificates than take stringent measure to prevent such occurrence. Forged certificate can lead to loss of integrity and credibility in the certificate and loss of public confidence in the certificate awarding institutions (Ofori-Mensah et al 2023), hence the application of the blockchain system in EMIS becomes imperative.
- **Access to education data**: One fundamental challenge confronting the educational managers is accessing current but reliable educational data. The EMIS should possess the infrastructural properties that could store, integrate, collect, process, share or disseminate education data. A weak link could results in unfulfilled expectation, obsolete and unreliable data processes. For instance, manual procession of academic transcript leads to delay, unpredictability and dissatisfaction. EMIS must be strong and predictable to lead to a functional system. The accessibility of real-time data is the goal in contemporary society hence a need for a Blockchain Technology in EMIS.
- **Security and Privacy Issues:** Cyber security is a serious issue in modern world of Information sharing and management. The Education Management Information System could be exposed to the threat of data breach as hacker and data theft could cripple a system if education data is not adequately protected. Blockchain presence, with its characteristics or framework could create a backbone for education data protection. Aloamaka (2023) opined that such could impact on data privacy and security reducing the dangers of threats and data breach.
- **Stakeholders Isolation:** Data generating process should be participatory, that is allowing education stakeholders to participate in the data-generating process. If the inputs are

trusted the outputs becomes valid and reliable. Education data are in form of Number of school buildings, Facilities/equipment, Number of Teachers, Students-Teachers Ratio, Students' Enrolment, Students Achievement Score, School Size and Class Size. If a system could automatically update itself and stakeholders are fully on the known, it would give credence to the database. The Blockchain ensures that every education data entry is time-stamped, providing an accurate log of where, when and who entered an information. The system updates and assists in monitoring real-time progress and addressing issues speedily. Once an education data is entered or retrieved, the blockchain registers it through a consensus mechanism known as Proof of Activity (PoA), it is immediately available to all participants' or stakeholders' in the block. This ensures that everyone including educational planners/managers is working with same datasets. World class educational institutions such as Massachusetts Institute of Technology, Stanford University, University College, London, University of Nicosia and the University of Melbourne are already using Blockchain Technology to issue certificate (Koshiry, 2023).

CONCLUSION

The use case of Blockchain technology in Education cannot be over-emphasized. The Blockchain Technology (BT) is highly needed in our educational system and institutions for transparency, securing of vital information, certificate, strengthening educational services such as registration, payment methods and online accreditation. Enhancing credential credibility and sharing in real time is the potential Blockchain Technology holds out to the educational managers and planners to achieve a better educational system.

RECOMMENDATIONS

Some suggestions for improvement are here made for improvement in EMIS.

1. Even though blockchain technology operates as a decentralized network over centralized system as its backbone, Ocheja et al (2016), advocate that conversation and consensus should be consolidated on standardization. No doubt, that standards establish the rules, regulations and limits. Information would be exchanged between multiple parties; there is a need for standardization to avoid challenges that could weaken the interoperability.
2. Institutions awarding certificates should study closely the benefits inherent in the blockchain technology with a view to importing valuable lessons learnt into their EMIS.
3. Educational institutions should organize seminar, conferences and workshop to popularize adaptation of the Blockchain technology in universities.

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Access to Vocational Education Programmes on Youth Employment and Income Generation

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Abstract

This study explored how access to vocational education programs affects youth employment and income generation in Epe and Ikorodu. It was driven by the rising youth unemployment rate and the increasing demand for practical skills that boost employability and economic empowerment among young people. A descriptive survey design was employed, using a quantitative approach. The population included youths living in Epe and Ikorodu, with a sample of 400 respondents selected through proportionate and simple random sampling methods. Data collection was carried out using a structured questionnaire, which had a reliability coefficient of 0.83, determined via Cronbach's Alpha. Descriptive statistics such as means and standard deviations addressed the research questions, while an independent sample t-test tested the hypotheses at a 0.05 significance level. The results indicated that youths' access to vocational education programmes was moderate, with respondents in Ikorodu having a higher mean score (3.42) compared to those in Epe (2.98). The study also found that vocational education programmes positively impacted youth employment, with an overall mean score of 3.41, and contributed to income generation, averaging 3.48. Hypothesis testing revealed a significant difference between respondents in Epe and Ikorodu regarding the programmes' contributions to employment ($t = 2.37$, $p < 0.05$) and income ($t = 2.64$, $p < 0.05$). The study concluded that access to these programmes significantly enhances youths' employment prospects and income potential. It recommended that the government increase investment in vocational education, improve training facilities, and ensure equitable access to vocational programmes across communities.

Keywords: Vocational education, youth employment, income generation, youth empowerment.

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INTRODUCTION

Youth employment and income generation are vital markers of economic stability, social progress, and national productivity. When young people actively participate in the labor market, they not only improve their own well-being but also drive broader economic growth and societal development. Employment gives youth financial independence, chances to develop skills, and a meaningful role in economic activities. On the other hand, ongoing youth unemployment can result in poverty, social exclusion, and greater risks of social unrest. (International Labour Organization, 2022; World Bank, 2021)

In numerous developing economies, young people often find it especially hard to move from education into employment. Many graduates leave formal schools with qualifications that do not always align with available job opportunities. Consequently, a large number struggle to find stable jobs or maintain a steady income. This issue has worsened recently because of population increases, economic ups and downs, and swift technological advancements that constantly redefine labour market needs.

Youth income generation is strongly connected to having relevant skills and competencies. Those with practical, market-ready skills tend to find it easier to get jobs or start their own businesses. Vocational education plays a key role here, offering young people the technical and entrepreneurial skills necessary to engage successfully in the economy. Research shows that vocational training programs improve youth employability by aligning with industry needs and labour market conditions (Mujuri & Kathomi, 2025).

Vocational education, often called Technical and Vocational Education and Training (TVET), centres on developing occupational skills via organized training programs. Unlike traditional academic routes, vocational courses prioritize practical knowledge, hands-on experience, and preparing students for the workforce. They usually encompass various skill sectors like electrical work, carpentry, tailoring, welding, mechanical services, IT, and other technical trades vital for economic production and service provision.

The increasing acknowledgment of vocational education as an effective approach to combat youth unemployment has led governments and development agencies to encourage participation in vocational training programs. Bas et al. (2024) argue that engaging in these programs boosts employment chances and improves individuals' capacity to participate in productive economic activities. By offering structured skill development and practical exposure to work environments, vocational education enables young people to develop competencies that are directly relevant to the labor market.

Vocational education is crucial for fostering entrepreneurship and self-employment among young people. In numerous developing nations with scarce formal job options, self-employment serves as a vital livelihood strategy. These vocational training programs typically combine entrepreneurship education, business management, and financial literacy, helping youth start small businesses and earn income independently. Adeoti (2024) highlights that acquiring vocational skills greatly enhances youth empowerment by providing sustainable livelihood opportunities.

Access to vocational education programmes involves the ability of individuals to obtain, participate in, and benefit from vocational and technical training without facing major barriers such as cost, location, poor facilities, or limited course options. It covers the availability, affordability, accessibility, and inclusiveness of training that aims to develop practical and marketable skills (UNESCO, 2021). This access goes beyond mere enrolment, also including learners' capacity to effectively utilize training that aligns with labour market needs.

The United Nations Educational, Scientific and Cultural Organization emphasizes that equitable access to vocational education is crucial for fostering inclusive economic growth and equipping young people for productive roles in modern economies. Similarly, Okoye and Chijioke (2021) highlighted that access to vocational training improves youths' practical skills vital for employment and entrepreneurship. They argued that young individuals with increased exposure to vocational opportunities are more likely to find stable jobs and attain economic independence. Additionally, Tripney and Hombrados (2022) noted that access to vocational programs greatly affects employment prospects, especially when training is affordable, industry-relevant, and aligned with current market needs. Their research underlines that restricted access to vocational education can lead to skills shortages and lower employability among youth.

Access to vocational education programmes is essential for improving youth employment prospects. When young people can participate in high-quality vocational training, they gain relevant skills, boost their employability, and increase their earning potential. On the

other hand, limited access to these programmes hampers skills development and decreases the chances of successful entry into the labour market.

Although there is an increasing amount of research on vocational education, most studies mainly highlight its overall benefits. They pay limited attention to how access itself affects youth employment and income, especially within local communities. Additionally, many previous works focus on national-level analysis without exploring disparities in access among various communities. This study aims to address this gap by specifically analyzing how access to vocational programmes impacts youth employment and income in Epe and Ikorodu, Lagos State.

Although vocational education is acknowledged as important, numerous young people encounter obstacles that hinder their participation in vocational training. These include limited training facilities, scarce funding, lack of awareness about available programs, and societal attitudes favoring academic over vocational education. These issues often diminish the ability of vocational systems to effectively combat youth unemployment and income disparity.

This study examines how access to vocational education programs affects youth employment and income, aiming to contribute to the wider research on skills development, economic involvement, and sustainable livelihood options for young people.

Statement of the Problem

Youth unemployment and low-income earners among young people remain significant socio-economic issues in many societies. Despite the growth of formal education systems and the rising number of graduates entering the workforce annually, many young individuals still find it difficult to obtain meaningful jobs or develop stable income sources. This situation prompts important questions about whether the current education system effectively prepares young people for productive engagement in the labour market.

The World Bank's 2020 report highlighted that many young graduates have strong theoretical knowledge but lack practical skills suitable for employment or entrepreneurship. Consequently, they often face prolonged periods of unemployment or underemployment after finishing their studies. This gap between education and job outcomes indicates that the problem is not just about job availability, but also the mismatch in skills gained during education. This issue is commonly linked to skills mismatch, where the abilities learned through formal education do not match labour market needs.

Vocational education programmes were introduced in many educational systems to bridge this gap by offering practical, marketable skills. However, vocational education is often seen as a secondary choice compared to academic pathways. This perception can deter young people from enrolling in vocational training, despite its valuable employment prospects. Additionally, existing vocational initiatives may struggle with issues like poor facilities, outdated equipment, lack of funding, and limited collaboration with industry stakeholders.

Therefore, ongoing issues like youth unemployment and low-income levels raise questions about whether vocational education programs are adequately accessible and effective in tackling these problems. If access to vocational education genuinely boosts employability and income potential, then broadening access could substantially improve economic prospects for young people, leading to increased income.

It is crucial to evaluate how access to vocational education influences youth employment and income. Gaining this understanding will determine whether vocational training effectively helps reduce youth unemployment and improves young people's economic opportunities.

Research Questions

The following research questions were raised to guide the study.

1. What is the level of youths' access to vocational education programmes in Epe and Ikorodu?
2. To what extent do vocational education programmes contribute to youth employment?
3. To what extent do vocational education programmes contribute to income generation among youths?

Research Hypotheses

The following null hypotheses were formulated to guide the study and were tested at 0.05 level of significance:

H_{01}: There is no significant difference in the perception of the contribution of vocational education programmes to youth employment between respondents in Epe and Ikorodu.

H_{02}: There is no significant difference in the perception of the contribution of vocational education programmes to income generation between respondents in Epe and Ikorodu.

Significance of the Study

The following group of people will benefit from this study: the policymakers, youth, researchers and institutions in the following ways:

Initially, the study offers valuable insights for policymakers and government agencies involved in youth development and education planning. It examines how access to vocational education programmes affects youth employment and income, potentially emphasizing the need to improve accessibility, curriculum relevance, and training facilities. These insights can guide institutions in creating programmes that better prepare young people with practical skills for the job market.

Finally, youth development organizations and NGOs involved in skills training can benefit from these findings. Recognizing how vocational education improves employment prospects and income can help create more impactful youth empowerment programs.

Conceptual Framework

Vocational education programmes, commonly referred to as Technical and Vocational Education and Training (TVET), are designed to equip individuals with practical skills and technical competencies required for specific occupations or trades. Unlike traditional academic education, which emphasizes theoretical knowledge, vocational education focuses on hands-on training, workplace readiness, and the acquisition of industry-relevant skills. Delivered through vocational schools, technical colleges, and apprenticeship systems, these programmes play a crucial role in bridging the gap between formal education and labour market demands (Okoye &Chijioke, 2021). Through structured training in areas such as electrical installation, carpentry, tailoring, and information technology, learners acquire competencies that can be directly applied in the workplace, thereby enhancing their productivity and employability. In this sense, vocational education contributes significantly to human capital development and economic participation (Tripney&Hombrados, 2022).

Youth employment, which refers to the engagement of young people in productive economic activities, remains a key indicator of economic development and social stability. However, youth unemployment continues to persist, particularly in developing economies where many young people face challenges such as limited work experience, skills mismatch,

and inadequate access to training opportunities. This situation underscores the importance of vocational education as a mechanism for improving employment outcomes. Closely linked to employment is income generation, which reflects the ability of individuals to earn a livelihood through wage employment or self-employment. For many youths, especially in contexts with limited formal job opportunities, income generation depends largely on the acquisition of practical and marketable skills. Vocational education programmes are therefore widely recognized as effective tools for enhancing income-earning capacity by enabling individuals to engage in productive and entrepreneurial activities (Audu, Kamin, &Balash, 2020).

The relationship between vocational education and youth employment outcomes can be understood through the lens of Human Capital Theory and Skills Acquisition Theory. Human Capital Theory posits that investment in education and training enhances individuals' knowledge, skills, and competencies, thereby increasing their productivity and earning potential. Within the context of this study, the theory is particularly relevant as it explains how access to vocational education programmes serves as an investment that improves the economic value of youths in the labour market. By acquiring vocational skills, young people become more employable and better positioned to generate income through both wage employment and entrepreneurial ventures (Becker, 1993; Okoye &Chijioke, 2021). Complementing this perspective, Skills Acquisition Theory emphasizes the process of learning through practice and experience, highlighting the importance of hands-on training in developing competence. Its relevance to this study lies in its explanation of how exposure to vocational training enables youths to acquire practical skills that are directly applicable to income-generating activities, thereby enhancing their competitiveness in the labour market and their capacity for self-employment.

Empirical review

Empirical evidence further supports the role of vocational education in improving youth employment and income outcomes. Audu, Kamin, and Balash (2020) found that vocational training enhances employability skills and promotes self-employment among participants, emphasizing its role in youth empowerment. Similarly, Okoye and Chijioke (2021) reported that vocational education contributes significantly to job creation, entrepreneurship development, and improved income levels among Nigerian youth. Tripney and Hombrados (2022), in a systematic review, also observed that vocational training programmes positively influence employment rates and earnings, although their effectiveness is influenced by factors such as programme quality and relevance.

Despite these contributions, important gaps remain in the literature. Existing studies largely focus on the general outcomes of vocational training without sufficiently examining the role of access to such programmes as a critical determinant of youth employment and income generation. In addition, there is limited emphasis on how disparities in access to vocational education affect outcomes at the local level, particularly within specific communities. Furthermore, while many studies examine either employment or income generation, few consider both variables simultaneously as interconnected outcomes of vocational education. This study therefore seeks to address these gaps by examining how access to vocational education programmes influences both youth employment and income generation within Epe and Ikorodu, thereby providing more nuanced and specific insights into the effectiveness of vocational training initiatives.

METHODOLOGY

This study adopted a quantitative research approach using a descriptive survey design to examine the influence of access to vocational education programmes on youth employment

and income generation. The population consisted of 200,000 youths residing in Epe and Ikorodu, selected for their large youth populations and active participation in vocational training initiatives. A total of 400 respondents were sampled to ensure reliable representation. To ensure fair representation, a proportionate sampling technique was applied based on population distribution, with 240 respondents (60%) selected from Ikorodu and 160 respondents (40%) from Epe. Within each location, simple random sampling was employed to give all eligible youths an equal chance of selection, minimizing bias and enhancing representativeness. Data were collected using a structured questionnaire containing closed-ended items on access to vocational education, employment status, and income generation, which was developed based on the study objectives and validated by experts for content and face validity. The instrument's reliability was confirmed through a pilot test conducted among selected youths outside the study area. The responses obtained were analyzed using Cronbach's Alpha, which yielded a reliability coefficient of 0.83, indicating a high level of internal consistency and confirming that the instrument was reliable for the study. Questionnaires were administered directly to respondents, with ethical considerations such as informed consent, confidentiality, and voluntary participation strictly observed. Data were analyzed using descriptive statistics, including frequencies, percentages, and mean scores.

RESULTS

A total of 400 structured questionnaires were administered to youths in Epe (n = 160) and Ikorodu (n = 240). All questionnaires were retrieved and used for analysis. The respondents were aged between 18 and 35 years. The gender distribution showed that 216 (54%) were male, while 184 (46%) were female. In terms of educational qualification, 40% had completed secondary education, 35% had post-secondary vocational training, and 25% had tertiary education.

Research Question One

What is the level of youths' access to vocational education programmes in Epe and Ikorodu?

Table 1: Access to Vocational Education Programmes

Location	N	Mean	Std. Deviation	Interpretation
Epe	160	2.98	0.88	Moderate access
Ikorodu	240	3.42	0.81	High access
Total	400	3.24	0.86	Moderate access

Source: Field Survey, 2026

The findings indicate that youths in Ikorodu have greater access to vocational education programmes compared to those in Epe. Overall, access in both areas is moderate, showing that vocational education opportunities are unevenly distributed. This contradicts UNESCO (2021), which states that expansion policies have greatly improved access in many urban and semi-urban regions, implying that local implementation gaps may still be present.

Research Question Two

To what extent do vocational education programmes contribute to youth employment?

Table 2: Vocational Education and Youth Employment

Location	N	Mean	Std. Deviation	Interpretation
Epe	160	3.18	0.81	Moderate contribution
Ikorodu	240	3.56	0.79	High contribution
Total	400	3.41	0.86	High contribution

Source: Field Survey, 2026

The findings indicated that vocational education programs positively impact youth employment, especially in Ikorodu, where the effects are more pronounced than in Epe. This

supports Okoye and Chijioke (2021), who noted that vocational training greatly boosts employability among Nigerian youths. Additionally, it agrees with Audu, Kamin, and Balash (2020), who stated that vocational training enhances job preparedness and self-employment prospects.

Research Question Three

To what extent do vocational education programmes contribute to income generation among youths?

Table 3: Vocational Education and Income Generation

Location	N	Mean	Std. Deviation	Interpretation
Epe	160	3.21	0.79	Moderate contribution
Ikorodu	240	3.60	0.74	High contribution
Total	400	3.48	0.83	High contribution

Source: Field Survey, 2026

The findings show that vocational education programs significantly contribute to increasing income among youths, particularly in Ikorodu. This agrees with Tripney and Hombrados (2022), who found that vocational training improves earnings and self-employment outcomes. However, McGrath (2021) cautioned that vocational education alone may not guarantee income growth without backing from economic structures such as access to credit and markets.

Hypothesis One

H_{01}: There is no significant difference in the perception of the contribution of vocational education programmes to youth employment between respondents in Epe and Ikorodu.

Table 4: Independent Samples t-test (Youth Employment)

Group	N	Mean	Std. Deviation
Epe	160	3.18	0.81
Ikorodu	240	3.56	0.79

Table 4.1: t-test Output

t	df	Sig. (2-tailed)	Mean Difference
2.37	398	0.018	-0.38

Since p (0.018) < 0.05, H_{01} is rejected.

The independent samples t-test showed a notable difference between respondents from Epe and Ikorodu on how vocational education programs contribute to youth employment ($t = 2.37$, $p < 0.05$). This indicates that youths in Ikorodu see vocational education as playing a more significant role in employment outcomes than those in Epe. According to Okoye and Chijioke (2021), vocational education greatly enhances employability, particularly when training facilities are accessible and well-equipped.

Hypothesis Two

H_{02}: There is no significant difference in the perception of the contribution of vocational education programmes to income generation between respondents in Epe and Ikorodu.

Table 5: Independent Samples t-test (Income Generation)

Group	N	Mean	Std. Deviation
Epe	160	3.21	0.79
Ikorodu	240	3.60	0.74

Table 5.1: t-test Output

t	df	Sig. (2-tailed)	Mean Difference
2.64	398	0.009	-0.39

Since p (0.009) < 0.05, H_{02} is rejected.

The t-test revealed a significant difference in income generation perceptions between respondents in Epe and Ikorodu ($t = 2.64$, $p < 0.05$). This suggests that youths in Ikorodu view

vocational education programmes as more effective for income generation than those in Epe. The result aligns with Tripney and Hombrados (2022), who found that vocational training programs substantially enhance earnings and self-employment prospects among youths in low- and middle-income countries.

Discussion of Findings

The study found that youths' access to vocational education programmes in Epe and Ikorodu was moderate, with an overall mean score of 3.24. However, respondents in Ikorodu recorded a higher mean score (Mean = 3.42) than those in Epe (Mean = 2.98), indicating better access to vocational training opportunities in Ikorodu. This suggests that access to vocational education programmes may vary across locations due to differences in infrastructure, the availability of training centres, and economic opportunities. The finding aligns with the International Labour Organization's (2022) report, which stated that unequal access to vocational education remains a major factor influencing youth development and employability in developing economies.

The findings further showed that vocational education programmes contribute positively to youth employment. The overall mean score of 3.41 indicates that respondents generally agreed that vocational training enhances employment opportunities among young people. Respondents in Ikorodu recorded a higher mean score (Mean = 3.56) than those in Epe (Mean = 3.18), implying that young people in Ikorodu perceived vocational education programmes as contributing more significantly to employment outcomes. This may be attributed to greater exposure to vocational centres and wider employment opportunities within the area. The result supports the findings of Okoye and Chijioke (2021), who reported that vocational education significantly improves employability and enhances young people's chances of securing jobs and engaging in self-employment activities in Nigeria.

Similarly, the findings revealed that vocational education programmes contribute significantly to income generation among young people. The overall mean score of 3.48 indicates a high contribution of vocational education to income generation. Respondents in Ikorodu recorded a mean score of 3.60, while respondents in Epe recorded a mean score of 3.21. This suggests that young people with greater access to vocational training are more likely to engage in productive economic activities capable of generating income. The finding is in line with Tripney and Hombrados (2022), who found that vocational training interventions positively influence earnings, entrepreneurship, and self-employment outcomes among young people.

The test of hypothesis one revealed a significant difference in respondents' perceptions of the contribution of vocational education programmes to youth employment between Epe and Ikorodu ($t = 2.37$, $p = 0.018$). Since the p-value was below the 0.05 level of significance, the null hypothesis was rejected. This implies that location significantly influences respondents' perceptions of the contribution of vocational education programmes to youth employment. The higher mean score recorded in Ikorodu (Mean = 3.56) compared with Epe (Mean = 3.18) further confirms that respondents in Ikorodu perceived vocational education programmes as contributing more effectively to employment opportunities. This finding supports the study conducted by Audu, Kamin, and Balash (2020), which revealed that access to vocational skills training significantly improves employability and labour market participation among youths.

Hypothesis two also revealed a significant difference in perceptions of the contribution of vocational education programmes to income generation between respondents in Epe and Ikorodu ($t = 2.64$, $p = 0.009$). As the p-value was less than 0.05, the null hypothesis was

rejected. The result indicates that vocational education programmes significantly influence income generation among youths across the two locations. Respondents in Ikorodu recorded a higher mean score (Mean = 3.60) than those in Epe (Mean = 3.21), suggesting that increased access to vocational education programmes enhances youths' capacity to generate income. This finding corroborates the International Labour Organization's (2022) report, which emphasised that vocational education equips young people with practical and entrepreneurial skills necessary for income generation and economic empowerment.

Summary of Findings

The study examined the influence of access to vocational education programmes on youth employment and income generation in Epe and Ikorodu, Lagos State. Based on the analysis of data collected, the following findings were made:

1. Youth access to vocational education programmes in Epe and Ikorodu was moderate. However, respondents in Ikorodu had greater access than those in Epe.
2. Vocational education programmes have a positive impact on youth employment, with respondents supporting the idea that vocational training improves employability and broadens chances for self-employment.
3. Vocational education programmes have played a vital role in helping youths generate income by providing them with practical skills for productive economic pursuits.
4. There was a significant difference between respondents in Epe and Ikorodu regarding the contribution of vocational education programmes to youth employment.
5. There was also a significant difference between respondents in Epe and Ikorodu regarding the contribution of vocational education programmes to income generation.

CONCLUSION

The study concludes that access to vocational education programmes plays a key role in improving youth employment and income generation. Vocational education equips young people with practical, marketable skills that enhance their employability and capacity to engage in income-generating activities. However, disparities in access to vocational education between Epe and Ikorodu suggest that geographical and infrastructural factors may affect the effectiveness of such programmes. The findings therefore underscore the need for increased investment in vocational education and for the equitable distribution of training opportunities to promote youth economic empowerment and reduce unemployment.

Recommendations

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

1. Government and relevant stakeholders ought to boost investment in vocational education programmes, especially in underserved areas like Epe, to allow more youths to access skills development opportunities.
2. Vocational training centres need to be properly equipped with up-to-date facilities and skilled instructors to enhance the quality and relevance of their training programs.
3. Enhanced collaboration between vocational training institutions and industries is essential to ensure that the skills students acquire meet labour market demands.
4. Financial support mechanisms, including grants, loans, and entrepreneurship programs, should be offered to youths who complete vocational training to boost income generation and ensure business sustainability.
5. Awareness campaigns should be strengthened to promote youth involvement in vocational education programs as practical routes to employment and economic independence.

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Application of Intelligent Tutoring Systems and Adaptive Learning Platforms in Course Delivery by Economics Educators in Public Tertiary Institutions in Abia State, Nigeria

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Abstract

The study assessed the application of Intelligent Tutoring Systems and Adaptive Learning Platforms in Course Delivery by Economics Educators in Michael Okpara University of Agriculture, Umudike. Two research questions guided the study. A descriptive survey research design was adopted to explore the current state of artificial intelligence application by Economics educators' in course delivery. The population of the study is 46 Economics lecturers in tertiary institutions in Abia State. This comprised 14 Economics Education lecturers and 32 Economics lecturers. Census sampling was adopted for the study because the population is of manageable size. The instrument for data collection was a structured questionnaire, titled "Application of Artificial Intelligence in Course Delivery by Economics Educators Questionnaire (AAICDEEQ)," developed by the researcher. The instrument was face validated by three experts; two from Economics Education programme and one from Measurement and Evaluation all from College of Education Michael Okpara University of Agriculture, Umudike. Cronbach Alpha reliability coefficient was used to determine the reliability coefficient of the instrument and the instrument yielded a reliability coefficient of 0.74 which was high enough for the instrument to be considered reliable. Nine copies of the questionnaire were distributed to the respondents and also retrieved by the researcher. The mean and standard deviation were used to answer the research questions, and the t-test was used to test the null hypotheses at the 0.05 level of significance. The findings revealed that the application of AI in course delivery by Economics educators in public tertiary institutions in Abia State is currently at a low level. Based on the findings, the study recommended among others that educational authorities and stakeholders should organize regular seminars and workshops to train and retrain Economics educators on the effective use of AI in course delivery.

Keywords: Artificial Intelligence, Economics educators, Intelligent Tutoring System, Adaptive learning platform.

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INTRODUCTION

The application of Artificial Intelligence (AI) into educational settings has emerged as one of the most transformative innovations of the 21st century, especially in the field of Economics Education. As institutions strive to keep pace with rapid technological advancements, Artificial Intelligence (AI) offers promising opportunities to reshape, instructional delivery, teaching methodologies, improve learning outcomes, and ensure that students are better prepared for the demands of a digital economy. In the education sector, Artificial Intelligent (AI) is currently emerging as a technology that enhances the effectiveness of the teaching and learning process. Globally, AI has evolved into a strategic tool that not only supports but also enhances the effectiveness of education by enabling personalization efficiency, and innovation in instructional delivery (Chen et al., 2020). According to Ogunode, Agbade and Bassey (2023), artificial intelligence (AI) is a program designed with human-like intelligence and structured in forms of computers, robot, or other machines to aid in the

provision of any kind of service or tasks to improve social, economic and political development of the society.

According to Bailey (2023), artificial intelligence is a branch of computer science that focus on creating software capable of mimicking behaviours and processes we would consider "intelligent" if exhibited by humans, including reasoning, learning, problem-solving and creativity. AI systems can be applied to an extensive range of tasks, including language translation, image recognition and generative AI, producing content and knowledge rather than simply searching for and retrieving it. Similarly, Ogunode and Ejike (2023) viewed artificial intelligence (AI), as a machine programme forms with capacities and abilities to execute tasks and responsibilities that human beings perform with the assistance of human-like intelligence. Furthermore, Koniayev and Gray (2024), observed that the advent of artificial intelligence in education indicates a new era of instructional design and delivery. AI's application into the academic sphere is not just about technological adoption but about reimagining the educational landscape to enhance learning experiences, improve operational efficiencies, and equip students with the skills required for the contemporary world of works.

The deployment of AI in tertiary institutions can assist lecturers to use a variety of teaching methods in the course delivery. Borbajo et al. (2023) found that AI integration in the classroom supported diverse learning styles and individual needs. Using natural language processing and machine learning algorithms, AI tools could accommodate various learning preferences, such as visual, auditory, or kinesthetic. Students with learning difficulties or special needs also benefited from AI-powered assistive technologies, which provided tailored interventions and accommodations, enabling them to access and engage with the course more effectively. Ogunode, Edinoh and Chinedu (2023) opined that AI systems can "gauge a student's learning style and pre-existing knowledge to deliver customized support and instruction." According to an article in the Atlantic, Artificial intelligence promises personalized education for all, artificial intelligence holds the potential to "enhance human teachers' abilities to tailor lessons to each student without knocking their class schedule off track," eliminating the need for educators to "teach to the middle," as often happens when their students have a range of skill levels and learning abilities.

Artificial Intelligence (AI) in tertiary institutions has helped institutions moved from traditional teaching to online platforms. Artificial Intelligence can also aid learners in soft-skill coaching. life skills, and self-development through interactive virtual simulations. Also, AI encompasses a range of technologies designed to perform tasks that typically require human intelligence, such as learning, reasoning, problem-solving, and decision-making. In Economics education, AI applications have manifested in Intelligent Tutoring System (ITS), Adaptive Learning Platforms (APL), Virtual Reality simulations, and Automated Administrative tasks, which significantly reduce workload and improve resource management (Atah & Alabi, 2025). The potential of AI lies in its capacity to tailor course delivery to individual learning styles, thereby improving comprehension and retention rates.

Intelligent Tutoring System (ITS) or commonly known as Intelligent Computer-Aided Instruction is a system which provides teaching that can adapt to students' abilities. It is one of the developments in expert systems in artificial intelligence in the field of learning. Intelligent Tutoring Systems, for example, replicate the functions of human tutors by offering personalized feedback and adaptive learning pathways, thus ensuring that each student progresses at an appropriate pace (Atah & Alabi, 2025). Examples of Intelligent Tutoring System (ITS) are Intelligent Tutoring System (ITS) based on Augmented Reality (AR) for Dimensional Geometry Material, Intelligent Tutoring System for Nun Sukun or Tanwin law learning, Intelligent Tutoring System (ITS) for circular learning, and various other ITS. (Abu-

Ghali et al., 2018) stated that The Intelligent Tutoring System (ITS) is a computer program that provides students with personalized education and feedback without the need for human intervention. The intelligent tutoring system was provided to a group of students of all ages to test and observe its effects. The system adjusts to each student's unique characteristics and progresses them from an easier to a more difficult level (Alhabbash et al., 2016). Intelligent Tutoring System (ITS) with an adaptive learning platform in course delivery by Economics educators ensures that students receive not only the flexibility to learn at their own pace but also the support and guidance necessary to excel in areas they find challenging.

Adaptive learning platform is an AI-powered adaptive learning platform that personalizes educational experiences by analyzing student performance and adjusting content delivery based on individual needs. Its core function is to provide personalized recommendations and adaptive learning pathways for students, ensuring they receive the right content at the right time (Kim, 2018). Adaptive learning platform helps Economics educators' and students by offering tailored teaching and learning experiences The platform uses machine learning to analyze students' strengths, weaknesses, and learning behaviours, adjusting the curriculum accordingly to optimize understanding and retention. According to Bogle and Robinson (2016), the use of adaptive learning platforms in course delivery where students' learning paths are personalized based on real-time data, will show significant improvement in student retention and engagement, with students mastering of the course. Adaptive Learning Platforms continuously analyze performance data, modifying instructional strategies to address knowledge gaps and learning preferences (Pane et al., 2018). These innovations are particularly critical for Economics Education, which requires students to develop not only theoretical knowledge but also practical competencies (Chukwurah, Ben, Atah, Wonah, Idike, & Ingwe, 2023). These tools provide personalized learning experiences, enhance student engagement, and allow Economics educators to track learning performance in real time.

An Economics Educator is a person who teaches, trains, and guides learners in Economics, helping them understand how individuals, businesses, and government make decisions about the allocation of resources, the production and distribution of goods and services and their consumption Economics Educators have the responsibility of classroom instruction in a tertiary institution. Deployment of AI in tertiary institutions can aid effective instructional delivery of lectures by Economics educators. The Economics educator is one who is well-trained and well groomed in principle and in practice in the broad field of Economics Education. According to Olaniyan (2019)**,** an Economics educator is an individual trained to teach economic principles, theories, and applications in a manner that develops learners' analytical, critical thinking, and problem-solving skills for understanding economic issues in society. Similarly, Adeniyi and Osakede (2018) described an Economics educator as a facilitator of learning who interprets abstract economic concepts and relates them to real-life situations to enhance students' understanding of production, distribution, and consumption of goods and services.

In the view of Samuelson and Nordhaus (2017)**,** Economics educators play a vital role in equipping learners with the ability to analyze choices under conditions of scarcity, opportunity cost, and trade-offs, thereby preparing them for informed participation in economic and civic life. Beyond classroom instruction, Economics educators are also responsible for curriculum implementation, learner assessment, mentoring, and the integration of contemporary tools, such as digital technologies and artificial intelligence, to improve instructional delivery (Luckin et al., 2016). Economics educators bear a significant responsibility to prepare students for success in a constantly changing, fast-paced world of work that is increasingly influenced by artificial intelligence (AI), automation, and digital transformation. As AI continues to

reshape economic activities, labor markets, and decision-making processes, it is imperative for Economics educators to continuously adapt to emerging technological trends in instructional delivery.

Therefore, Economics educators play a pivotal role in equipping graduates with the knowledge, skills, and adaptive mindsets required thriving in an AI-driven world of work. By aligning instructional practices with AI-enabled pedagogies, Economics Education can foster innovation, self-reliance, and employability, while also contributing to sustainable economic development and improved graduate outcomes (Autor, 2022). Economics educators remain at the forefront of Economics Education programme. They need to possess the know-how on how AI-enabled systems can facilitate learning in such areas as research and data analytical skills to interpret data provided by AI-enabled systems, new skills to manage human and AI resources at their disposal, critical perception on how AI technologies affect human lives, win over repetitive tasks and achieve new skills and competencies (that cannot be replaced by machines provision to make value judgments. Meanwhile, given the current advancements and complexity of technology, the way Economics Education is delivered through the conventional lecture method of teaching, without adopting artificial intelligence as an accelerator and enhancer, seems to be a major hindrance. This seems to have led to the perceived production of half-baked Economics Education graduates that are not well groomed in the use of artificial intelligence tools. The quantity of graduates in the labour market seem to be on the rise because they seem to be deficient with the basic requisite skills to be employed or to be self-reliant. It is based on this that this study is aimed to investigate the Application of Artificial Intelligence in Course Delivery by Economics Educators in public tertiary institutions in Abia State.

Statement of the Problem

The rapid advancement of Artificial Intelligence (AI) is transforming teaching and learning processes globally, particularly in higher education where digital technologies are increasingly used to enhance course delivery, student engagement, personalization of learning, and assessment efficiency. In Economics Education, AI-driven tools such as intelligent tutoring systems, adaptive learning platforms, learning analytics, and virtual simulations have the potential to improve students' conceptual understanding, practical application of economic principles, and acquisition of digital competencies required in a technology-driven economy.

Despite these global developments, evidence suggests that the integration of AI technologies into teaching and learning in many Nigerian public tertiary institutions remains limited. Reports on higher education in Nigeria have shown persistent challenges such as inadequate ICT infrastructure, unstable electricity supply, poor internet connectivity, insufficient funding for digital learning resources, and limited access to modern instructional technologies. In Abia State, public tertiary institutions continue to face infrastructural and technological constraints that may hinder the effective adoption of AI-based instructional tools in course delivery.

Observations in the institutions under study indicate that Economics Education course delivery still relies heavily on conventional lecture methods, with limited utilization of AI-enabled teaching tools capable of promoting interactive learning, individualized instruction, real-time feedback, and data-driven decision-making. Although conventional teaching methods remain relevant in higher education, overdependence on them may limit opportunities for students to develop critical digital and analytical skills required in the contemporary labour market. In addition, many lecturers appear to have limited exposure to AI applications in education due to inadequate training opportunities, insufficient professional development programmes, and lack of institutional support for technology integration. There is also limited

empirical evidence on the extent to which Economics educators in public tertiary institutions in Abia State are aware of, have access to, and utilize AI technologies in course delivery. This lack of clear evidence creates a gap in knowledge regarding the readiness of lecturers and institutions to adopt AI-driven instructional practices. It is against this background that this study seeks to investigate the application of Artificial Intelligence in course delivery by Economics educators in public tertiary institutions in Abia State, with particular focus on the availability of AI tools, lecturers' level of utilization, perceived benefits, and the challenges affecting effective integration of AI in Economics Education.

Purpose of the Study

The purpose of this study was to assess the application of Intelligent Tutoring Systems and Adaptive Learning Platforms in Course Delivery by Economics Educators in Public tertiary Institutions in Abia State. Specifically, this study sought to determine:

1. the extent to which intelligent Tutoring Systems are applied in course delivery by Economics Educators in public tertiary institutions in Abia State.
2. the extent to which Adaptive Learning Platforms are applied in course delivery by Economics educators in public tertiary institutions in Abia State.

Research Questions

The following research questions guided the study:

1. To what extent are Intelligent Tutoring Systems (ITS) applied in course delivery by Economics educators in public tertiary institutions in Abia State?
2. To what extent is adaptive learning platforms (ALP) applied in course delivery by Economics educators' in public tertiary institutions in Abia State.

METHODOLOGY

The descriptive survey research design was used for this study. This design is highly relevant for adoption when a researcher intends to describe existing conditions and to explain the reasons for their prevalence. The area covered in this study was Abia State of Nigeria. The population of the study comprised of 46 Economics lecturers in tertiary institutions in Abia State. This comprised 14 Economics Education lecturers and 32 Economics lecturers. The study employed census sampling technique, utilizing the entire population of 46 Economics lectures in Abia State. Lohor in Emeh (2025) assert that population can be considered manageable and not in need of sampling if the population is small and fewer than 1000 unit. Therefore, the population for the study is below 1000 unit which makes it manageable. The instrument for data collection was a structured questionnaire, titled "Application of Artificial Intelligence in Course Delivery by Economics Educators Questionnaire (AAICDEEQ)," developed by the researcher. The instrument was face validated by three experts; two from Economics Education programme and one from Measurement and Evaluation all from College of Education Michael Okpara University of Agriculture, Umudike. Cronbach Alpha reliability coefficient was used to determine the reliability coefficient of the instrument and the instrument yielded a reliability coefficient of 0.74 which was high enough for the instrument to be considered reliable. The instrument was distributed by the researcher; all the nine copies of the questionnaire distributed to the respondents were also retrieved by the researcher. The instrument contains 20 items, 10 items on Intelligent Tutoring System (ITS) and 10 items on Adaptive Learning Platforms (ALP). The instrument is a four-point rating scale of Very High

Extent (VHE); High Extent (HE), Low Extent (LE), Very Low Extent (VLE) with values of 4, 3, 2 and 1 respectively.. The mean and standard deviation were used to answer the research questions, while the t-test was used to test the null hypotheses at a 0.05 level of significance. The real limit of the number was used to determine the level or extent of responses of each item on the research questions only. The real limit value is as follows; 3.50-4.00= Very high extent, 2.50-3.49=High extent, 1.50-2.49=Low extent, 1.00-1.49=Very low extent.

RESULTS

Research Question 1

To what extent is Intelligent Tutoring Systems (ITS) applied in course delivery by Economics educators' courses in public tertiary institutions in Abia State?

Table 1: Mean and standard deviation on the extent to which Intelligent Tutoring Systems (ITS) is applied in course delivery by Economics educators' in public tertiary institutions in Abia State

S/N	Item Statements	X	SD	Remark
1.	Intelligent Tutoring Systems platforms are applied to provide personalized learning experiences for Economics students.	2.00	0.50	Low Extent
2.	Intelligent Tutoring Systems are used to support the teaching of Economics concepts in my institution.	2.00	0.50	Low Extent
3.	Intelligent Tutoring Systems tools are used to diagnose students' learning difficulties in Economics courses.	1.89	0.33	Low Extent
4.	ITS are used to adapt Economics instructional content to students' individual learning pace.	2.11	0.33	Low Extent
5.	Economics educators are encouraged by their institutions to use ITS in course delivery.	2.00	0.50	Low Extent
6.	ITS tools are incorporated into online or blended Economics course delivery.	1.67	0.49	Low Extent
7.	ITS applications are accessible to both educators and students in the departments.	1.77	0.44	Low Extent
8.	Economics educators use ITS to provide remedial support for weak students.	1.89	0.60	Low Extent
9.	ITS applications are used to improve students' problem-solving skills in Economics.	1.56	0.53	Low Extent
10.	Intelligent Tutoring Systems are integrated into Economics course delivery during lectures.	2.00	0.50	Low Extent
	Grand Mean	**1.89**	**0.47**	**Low Extent**

VHE=Very High Extent, HE=High Extent, LE=Low Extent, VLE=Very Low Extent

The results in Table 1 show that the mean scores vary from 1.56 to 2.11. This indicates that the respondents rating were of a low extent to all of the statements in items 1–10. The data also indicates that the grand mean for the entire item is 1.89, which falls within the response option of low extent. This indicates that Intelligent Tutoring Systems (ITS) are being applied to a low extent in course delivery by Economics educators' in public tertiary institutions in Abia State. The standard deviation value ranging from 0.33 to 0.60 respectively reveal that their response values were compactly distributed; this implies that Intelligent Tutoring Systems (ITS) are being applied to a low extent in course delivery by Economics educators' in public tertiary institutions in Abia state.

Research Question 2

To what extent is adaptive learning platforms (ALP) applied in course delivery by Economics educators' in public tertiary institutions in Abia State?

Table 3: Mean and standard deviation on the extent to which adaptive learning platforms (ALP) applied in course delivery by Economics educators' in public tertiary institutions in Abia State.

S/N	Item Statements	X	SD	Remark
11.	Adaptive Learning Platforms are used to deliver Economics course content in my institution.	1.78	0.44	Low Extent
12.	Adaptive Learning Platforms is employed to personalize Economics learning based on students' abilities.	1.89	0.33	Low Extent
13.	Economics educators use ALP to adjust instructional content to students' learning pace.	1.78	0.44	Low Extent
14.	Adaptive Learning Platforms are used to identify students' strengths and weaknesses in Economics.	1.79	0.41	Low Extent
15.	Economics educators rely on ALP to monitor students' learning progress.	1.67	0.55	Low Extent
16.	Economics educators use ALP to differentiate instruction among diverse learners.	1.78	0.44	Low Extent
17.	Economics educators receive institutional support to use ALP in course delivery.	2.11	0.33	Low Extent
18.	Adaptive Learning Platforms are used to align Economics lessons with students' prior knowledge.	2.00	0.50	Low Extent
19.	ALP is employed to provide individualized Economics assignments to students.	2.22	0.44	Low Extent
20.	Economics educators use ALP-generated data to improve instructional decisions.	2.00	0.50	Low Extent
	Grand Mean	**1.90**	**0.44**	**Low Extent**

The results in Table 3 show that the mean scores vary from 1.67 to 2.22. This indicates that the respondents rating were of a low extent to all of the statements in items 11–20. The data also indicates that the grand mean for the entire item is 1.90, which falls within the response option of low extent. The grand mean score of 1.90 indicates that respondents ranked the items to a low extent. This indicates that adaptive learning platforms (ALP) are being applied to a low extent in course delivery by Economics educators' in public tertiary institutions in Abia State. The standard deviation value ranging from 0.33 to 0.50 respectively reveal that their response values were compactly distributed; this implies that adaptive learning platforms (ALP) are being applied to a low extent in course delivery by Economics educators' in public tertiary institutions in Abia State.

Discussion of Findings

The findings of the study in research question one revealed that the application of Artificial Intelligence (AI), specifically Intelligent Tutoring Systems (ITS), in course delivery by Economics educators in public tertiary institutions in Abia State is currently at a low extent. The grand mean of 1.89 obtained from the respondents indicates that ITS tools are rarely utilized for personalized instruction, diagnosis of students' learning difficulties, remedial support, or integration into online and blended learning environments. This finding suggests

that the adoption of AI-driven instructional technologies among the studied educators remains limited.

The low application of Intelligent Tutoring Systems observed in this study may be attributed to several institutional and infrastructural challenges. These include inadequate training of lecturers on the use of AI technologies, poor internet connectivity, unstable electricity supply, limited access to AI-enabled instructional platforms, and insufficient institutional support for technology integration. The low mean score recorded on the item relating to institutional encouragement further suggests that educators may not be receiving adequate administrative or technical support to incorporate ITS into course delivery. In addition, low awareness and limited exposure to AI-based instructional practices may also contribute to the poor utilization of ITS among Economics educators in the institutions studied.

The finding agrees with Chen, Chen, and Lin (2020), who observed that AI adoption in education in developing countries is still at an emerging stage due to infrastructural and technological limitations. Similarly, Ogunode, Agbade, and Bassey (2023) reported that inadequate digital infrastructure, poor funding, and lack of technical expertise constitute major barriers to the effective use of artificial intelligence in Nigerian tertiary institutions. Although literature has identified several potential benefits of Intelligent Tutoring Systems, such as personalized learning and adaptive instruction, these benefits were not directly measured in the present study and should therefore be viewed as implications drawn from previous studies rather than findings of this research.

The findings of research question two revealed that Adaptive Learning Platforms (ALP) are also applied to a low extent in course delivery by Economics educators in public tertiary institutions in Abia State, with a grand mean score of 1.90. The results indicate that Economics educators rarely use ALP to personalize instruction, monitor students' progress, adjust instructional content, or provide individualized learning activities. This finding demonstrates that AI-supported adaptive learning practices are not yet fully integrated into Economics Education within the institutions studied.

Possible explanations for the low utilization of Adaptive Learning Platforms include inadequate ICT facilities, poor access to digital learning resources, lack of AI-enabled learning management systems, insufficient professional development opportunities, and limited funding for educational technology. The low rating on institutional support also implies that many educators may not have access to the necessary technical assistance and infrastructure needed to effectively implement adaptive learning technologies. Furthermore, resistance to technological change and low awareness of AI applications in education may also contribute to the weak adoption of ALP among educators.

This finding is consistent with Ogunode, Edinoh, and Chinedu (2023), who noted that Nigerian tertiary institutions have not fully utilized AI-driven educational technologies due to inadequate infrastructure, limited technical expertise, and poor institutional preparedness. Existing literature has suggested that adaptive learning platforms can support personalized learning and data-driven instruction; however, the current study did not assess student achievement, engagement, instructional effectiveness, or learning outcomes. Consequently, such benefits should be interpreted as theoretical and literature-based implications rather than empirical findings from this study.

The study also found no significant difference in the mean ratings of male and female Economics educators regarding the application of ITS and ALP. However, this finding should be interpreted cautiously because the number of respondents involved in the study was relatively small, thereby limiting broad generalization on gender differences in AI application.

CONCLUSION

This study examined the application of Artificial Intelligence (AI) in course delivery by Economics educators in public tertiary institutions in Abia State, with particular emphasis on the use of Intelligent Tutoring Systems (ITS) and Adaptive Learning Platforms (ALP). The findings clearly indicate that the integration of AI-driven instructional tools in Economics Education within the studied institutions is currently limited. Both ITS and ALP were minimally utilized by Economics educators in course delivery, despite their widely acknowledged potential to enhance personalized learning, student engagement, real-time eedback, and instructional effectiveness.

The results further revealed no significant difference in the mean ratings of male and female Economics educators regarding the extent of use of both Intelligent Tutoring Systems and Adaptive Learning Platforms. This suggests that the low level of AI application is a general institutional and systemic issue rather than one influenced by gender differences among educators. The limited adoption of AI tools appears to be linked to challenges such as inadequate digital infrastructure, insufficient access to AI-enabled resources, limited professional training opportunities for educators, and weak institutional support frameworks. Overall, the study concludes that although Artificial Intelligence holds enormous potential to transform Economics Education and better prepare graduates for an increasingly digital and data-driven world of work, this potential remains largely untapped in public tertiary institutions in Abia State.

RECOMMENDATIONS

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

1. Government and institutional authorities should organize regular workshops, seminars, and in-service training programmes to equip Economics educators with the requisite skills for designing, adopting, and effectively using Intelligent Tutoring Systems in course delivery.
2. Public tertiary institutions should provide reliable internet connectivity, functional ICT facilities, and learning management systems that support the effective implementation of Adaptive Learning Platforms.

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Competency Needs of Senior Secondary School Agricultural Science Teachers in Cucumber (*Cucumis Sativus L.*) Production in Abia State, Nigeria

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Abstract

The study assessed the Competency needs of senior secondary school Agricultural Science teachers in Cucumber (Cucumis sativus L.) production in Abia State, Nigeria. The study addressed practical issues in Agricultural Education; the gap between the theoretical teaching and practical competencies in crop production. Focusing on cucumber production is timely, given its growing commercial importance in Nigeria. The study was guided by four objectives, research questions and corresponding hypotheses which are well aligned. This study adopted a descriptive survey research design with a population of 326 Agricultural Science teachers in the 250 public secondary schools in the three educational zones in Abia state. The sample of the study was 163 teachers of Agricultural Science obtained through random sampling techniques based on the educational zones in Abia State. Cucumber production competencies questionnaire was used for data collection, validated by experts and reliability of the instrument was established through Cronbach alpha method and it yielded an overall internal consistency of 0.82. Data for the study was collected by the researchers and three research assistants. The researchers collected the questionnaire from the respondents in a week interval and obtained a 100% return rate. The data collected were analyzed using mean, standard deviation and t-test. It was revealed that 8 competencies in pre-planting, 7 competencies in planting, 7 competencies in post-planting, 6 competencies in harvesting and 9 competencies in marketing were needed for cucumber production. It was recommended that the identified competencies be used by the Agricultural Science teachers in teaching cucumber production among others.

Keywords: Competency, Needs, Agricultural Science, Cucumber production.

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INTRODUCTION

Cucumber production is very popular in many African countries including Nigeria and other parts of the world. Rolnik and Olas (2020) opined that Cucumber (*Cucumis Sativus L.*) is a monoecious annual horticultural crop that belongs to the Cucurbitaceae family and it is cultivated across different agro-ecological zones in Africa. Cucumber is said to have spread from India to other parts of the world including West Africa (Okpani, Orji, & Umekwe 2023). The crop according to Ume, Onunka and Achike (2017) is the fourth most important vegetable after tomato, cabbage and onion in Asia, while it is rated as the second most important vegetable crop after tomato in Western Europe. Cucumbers are vegetables that can thrive in most parts of Nigeria making them a good crop, although it is mainly grown in the northern parts of the country (Nwoye, Orusha, Nze, & Ihugba, 2025). In Nigeria, it is regarded as one of the most commercially viable vegetables and very profitable as a venture if propagated. The most important varieties of cucumber are slicing, pickling and burp-less. Cucumbers come in three distinct types which are seedless cucumber, seeded, and mini cucumber. It is believed to have been cultivated by man for over 3,000 years (Adinde, Uche, Anieke, Odom, Igwe & Akor, 2021).

Cucumber belongs to the family of cucurbitaceae with four genera which include cucumis, citrullus, cucurbta and lufta. According to Hochmuth in Nnodim and Somoni (2019) affirmed that cucumber is a warm season crop that requires plenty of sunlight for minimum temperature of 15.60^{o}C.and a maximum temperature of 32.20^{o}C. Cucumber is a creeping vine that roots in the ground and grows up trellises or other supporting frames, wrapping around supports with thin, spiraling tendrils. The plant has large leaves that form a canopy over the fruit. The fruit of the cucumber is roughly cylindrical, elongated with tapered ends, and as large as 60centimeters (24inl) long and 10 centimeters (3.9inl) in diameter. In recent times, Cucumbers production has become a lucrative activity for most people because of its high demand by all classes of people. In submission of Asogwa, Odo and Obetta (2015) Cucumbers are adapted to a wide variety of soil types which have good drainage and adequate water holding capacity and do not perform well on acid soil but thrives well under slight acidity. Adebayo (2020) reported that cucumber is a popular vegetable used for salads and also processed into other useful food products. According to DiLonardo (2022) all the water in cucumbers can help to keep one hydrated as well as the fiber present in the fruit can help to boost one's body to stay regularly and avoid constipation.

Nutritionally, Sterm (2018) pointed out that cucumber has the advantage of being relatively low in calories and high in nutrients and an excellent source of fibre needed for a healthy digestive system. In supporting this, Uthpala, Marapana, Lakmini, and We-imuny (2020) reported that cucumbers possess other biological properties that make them outstanding such as anti-oxidant, anticarcinogenic, anti-microbial, anti-hyperglycemic, and anti-inammatory effects. Okonkwo-Emegha (2025) opined that cucumbers are long, cylindrical green fruits that contain about 95% water and are for this reason often recommended as natural diuretics and helpful for body building. According to Adinde, Uche, Anieke, Odom, Igwe and Akor (2021) it helps in healing diseases of urinary bladder and kidney, digestive problems like heart burn, acidity, gastritis and ulcer. Eaten cucumber helps in weight reduction and ensures a steady supply of glucose and high level of energy all day. In Abia State, cucumber is eaten raw with fried groundnut or used in the preparation of salads with other vegetables. In recent times, Cucumbers production in Abia State has become a lucrative activity for most people because of its high demand by all classes of people. For this reason cucumber has high level of market value that ranges from 25,000 naira to 40,000 naira for a 50kg bag and this could motivate senior secondary school students in going into its production.

Production has been defined as the process of combining some inputs to produce or manufacture tangible goods for human consumption or for other uses for man's benefit. Cucumber production has the potential to improve agricultural productivity, promote economic empowerment, and enhance food security (Okafor & Yaduma, 2021). Cucumber production is an important agricultural activity in eastern Nigeria, particularly in Abia State. In the context of the study, Cucumber production is the economic process of converting cucumber seed input into cucumber fruit or vegetable as output in order to certify human want. The practices involved in the cultivation process include pre-planting operations, planting operations, and post-planting operations, such as weeding, fertilizer application, harvesting, and processing of the fruits for consumption and other uses. Therefore, the success of cucumber production to meet human wants depends on the pre planting operations, planting operations, post planting operations, harvesting and marketing which the teacher needs to be competent to teach. An attempt to improve its production through the application of required relevant competencies is needful.

Competencies is the ability to do something well, measured against a standard, especially ability acquired through training or experience. Chukwone and Obichili (2019) stated that

competency is the required knowledge, skills and attitude needed by someone to perform an established task. Moreover, in the submission of Onah, Ojomu, Alilo and Eneji (2025) competency is the standard knowledge, skills, and attitude required for successful task execution. Professional competence involves more than just knowledge, skills, attitudes, and motivational variables but also contribute to the mastery of teaching and learning (Akinbode & Abati, 2019). In this study, competency needs refer to equipping secondary school students with practical skills for cucumber production, which are often lacking due to a theoretical curriculum. Agricultural science teachers provide general knowledge, but students may graduate without hands-on competencies for profitable farming. In the context of this study competency refers to the knowledge, skills and attitude which the teacher of agriculture needs for effective teaching of Agricultural science.

Agriculture according to Obue (2019) is the vehicle for national development. Agriculture is involves the processing and marketing of the products of animals and crops like cucumber (Omeje & Asogwa, 2013). Agricultural science is one of the subjects taught to students in secondary schools. Agricultural science according to Tibi in Onipede, Lawal, and Samuel (2020) is a subject designed to increase students' cognitive and physical talents in the field of agriculture, thereby enhancing their knowledge, skills, and outlook on self-improvement and national development. Given the increasing importance of agriculture in Nigeria, the competency development of teachers is paramount for improving educational standards and student engagement in Agricultural Science. Teachers, in this context, refer to individuals who are trained in agriculture with the duty of impacting knowledge and skill in cucumber production to students in senior secondary schools. Such individuals are popularly called teachers of agriculture. Furthermore, Babayo and Kesiki (2019) stated that those who teach agriculture are those trained in the pedagogical and technical areas of agriculture and charged with the responsibility of imparting knowledge and skills in agriculture to students. These mean that a teacher of agricultural science could be a male or female who has undergone a teacher preparatory programme in the area of agriculture. Being a teacher is a responsibility and task, and the teacher of agriculture is a main figure in implementing any agricultural programme at any level of education, especially at the secondary school levels where the students are still young who is zealous and passionate to learn. Teachers of agriculture that teaches senior secondary students made up of male and female teachers in Abia State.

In Abia State, it has been observed by the researcher that teachers of agricultural science depend mostly on text books and lecture method in teaching the students. The implication of these practices is that the senior secondary school students graduate from school without acquiring the basic competencies that will enable them to fix themselves into crop production such as cucumber production to make a living. Effective teaching at senior secondary school level can help close the skills gap if teachers possess the relevant technical and pedagogical competencies. Teachers in the twenty-first century need pedagogical skills to compete in the new digital world (Casillas, Cabezas, & Garca, 2019). These skills will help the teachers in effective teaching of cucumber production and general crop production in agricultural science. Cucumber plants can require a lot of water and nutrients, so agricultural teachers must plan carefully before and during planting. To ensure the most successful growth, Agricultural teachers should use seeds that are adapted to the environment and of high quality (Kong, Llewellyn & Zheng, 2018). Therefore, for the secondary agricultural science students to be self- reliant in cucumber production they are required to acquire the competencies in pre-planting, planting and field management operations.

In this study, pre-planting operations are all the activities carried out before the actual planting of seeds which include site selection, clearing of the land, stumping of the roots, tilling the soil with appropriate tools among others. This is followed by planting operations. The Agricultural Science teacher needs to carry out the actual planting which involves the actual process of placing planting materials into the soil. Such operations include opening the soil with appropriate tool for direct seed sowing, seed rate, spacing among others. The Agricultural Science teacher needs marketing competency in marketing of cucumber pods to increase income for their economic and emotional securities. Marketing involves all the activities relating to the flow of goods and services from the producer to the final consumer. Marketing, with reference to this study, involves all the activities that should be engaged in by the Agricultural Science teacher to move mature cucumber pods from the farm to the wholesalers or final consumers for the purpose of making profit. Such activities range from harvesting, cleaning, storing, and grading to transportation of pods safely to the potential buyers either at the farm gate or market. It is the belief of the researchers that if the Agricultural Science teachers acquire appropriate competencies in cucumber production, it will enable them to invest little money to expand their source of income and enhance their economic and emotional securities in the state. Hence the need for this study.

Statement of the Problem

The core problem facing agricultural education in Abia State, Nigeria, is the potential gap between the agricultural science teachers' existing competencies and the specific, up-to-date knowledge and practical skills required for effective teaching in modern cucumber production. Agricultural science is a vocational subject intended to equip students with the necessary skills for self-reliance and potential employment in the agricultural sector. This objective is often hindered by a persistent reliance on theoretical instruction and a lack of practical exposure and application of classroom instruction in real-world scenarios. The inability of many teachers to effectively impart knowledge to students is partly due to deficiencies of practical skills in teachers' competencies. There is need to identify the **c**ompetency needs of Agricultural Science teachers in their subject area, in order to trace their area of needs and weaknesses and to suggest ways of meeting up their needs for effective teaching of students. However, if the teachers' **c**ompetency needs are left unidentified, it will undermine the students' skills development and will hinder the objectives of Agricultural science as a vocational subject.

The researchers observed that most of the senior secondary school students could not embark on cucumber production even when they have passed through agricultural science classes. This is skill deficiencies problem on cucumber production. If these competencies (pre planting operations, planting operations, post planting operations, harvesting and marketing) needed in cucumber production were identified and used in teaching the senior secondary agricultural science students while in school, there is the tendency that they could take jobs in cucumber production after graduation. This will help to improve their living, limit rural urban migration, increase cucumber availability in the market and improve the overall economy of Nigeria. Production of cucumber in Abia State is beginning to gain attention and the researchers reasoned that cucumber production is a viable lucrative venture that requires adequate competencies in the operation. Hence the need to identify the competency needs of senior secondary school Agricultural Science teachers in cucumber production in the study area.

Purpose of the Study

The general purpose of this study was to identify the competency needs of senior secondary school Agricultural Science teachers in Cucumber (Cucumis sativus L.) production in Abia State, Nigeria. Specially, the study sought to identify the:

1. pre-planting operational competencies needed by agriculture teachers for effective teaching of cucumber production;
2. planting operational competencies needed by agriculture teachers for effective teaching of cucumber production;
3. post-planting operational competencies needed by agriculture teachers for effective teaching of cucumber production;
4. harvesting operational and marketing competencies needed by agriculture teachers for effective teaching of cucumber production; and

Research Questions

1. What are the pre-planting operational competencies needed by agriculture teachers for effective teaching of cucumber production?
2. What are the planting operational competencies needed by agriculture teachers for effective teaching of cucumber production?
3. What are the post-planting operational competencies needed by agriculture teachers for effective teaching of cucumber production?
4. What are the harvesting operational and marketing competencies needed by agriculture teachers for effective teaching of cucumber production?

Hypotheses

The following null hypothesis were tested at 0 .05 level of significance in line with purpose of the study.

HO_1: There is no significant difference between the mean ratings of the male and female responses of senior secondary school agricultural science teachers on pre-planting operational competencies needed for cucumber production.

HO_2: There is no significant difference between the mean ratings of the male and female responses of senior secondary school agricultural science teachers on planting operational competencies needed for cucumber production.

HO_3: There is no significant difference between the mean ratings of the male and female responses of senior secondary school agricultural science teachers on post-planting operational competencies needed for cucumber production.

HO_4: There is no significant difference between the mean ratings of the male and female responses of senior secondary school agricultural science teachers harvesting operational and marketing competencies needed by agriculture teachers for effective teaching of cucumber production.

METHODOLOGY

This study adopted a descriptive survey research design. This design according to Uzoagulu in Ugwuede, Aneke and Ozougwu (2023) is a design in which generalisation are made over the entire population from an ample of a sample population. This design was

considered appropriate because the views of a representative of the respondents were assessed using questionnaire and the findings were generalized on the entire population. The population of the study was 326 Agricultural Science teachers in the 250 public secondary schools in the three educational zones in Abia state. The distribution of the population according to the zones were Aba zone 101 public secondary schools, 140 Agricultural Science teachers, Umuahia zone 58 public secondary schools, 76 Agricultural Science teachers and Ohafia zone 91 public secondary schools, 110 Agricultural Science teachers. The sample of the study was 163 teachers of Agricultural Science obtained through random sampling techniques based on the educational zones in Abia State. In Aba education zone 70, Umuahia education zone 38 and Ohafia education zone 55. Making it total of 163 respondents that corresponds to a 50% sample size. This is in agreement with the statement of Boll, Boll and Gall in Asogwa, Onu and Egbo (2013) which stated that when a defined population is less than one thousand, 50% could be used to minimize sample error. Cucumber Production Competencies Questionnaire (CPCQ) was used for data collection based on four-point response options such as Highly needed (HN), Averagely needed (AN), Slightly needed (SN) and Not needed (NN) with 4, 3, 2 and 1 as their weighting value respectively and validated by experts. Reliability of the instrument was established through Cronbach alpha method and it yielded an overall internal consistency of 0.82. Data for the study was collected by the researchers and three research assistants. One hundred six three copies of questionnaire was administered to the respondents by the researcher with the help of research assistant from each zone. The researchers collected the questionnaire from the respondents in a week interval and obtained a 100% return rate of the filled questionnaires. The data collected were analyzed using mean, standard deviation and t-test to test the null hypothesis at 0.05 level of significance. Tables were clearly presented and any item with a mean range less than 2.50 was interpreted as not needed. The standard deviation was used to analyse the disparity in response patterns of the respondents; a lower value means closely related responses among respondents while a higher value means different opinion (response) on the same item. The null hypothesis was upheld when the probability value was greater than or equal to 0.05 level of significance ($p \geq a$) indicating that there was no significant (NS) difference in the compared means, but not upheld when the probability value is less than 0.05 level of significance ($p<a$) indicating that there was significant difference (S) in the compared means and data were presented on tables.

RESULTS

The results of the study were obtained from the research questions answered and hypotheses tested in Tables 1 to 4.

Table 1: Mean rating and t-test analysis responses of male and female agricultural science teachers on pre-planting operational competencies needed by for effective teaching of cucumber production

S/N	Pre-Planting Operation	$\bar{x}_M$	SD_M	$\bar{x}_F$	SD_F	T.cal	REMARK
1.	Acquire an area of land with a well-drained and fertile soil	3.80	1.58	3.30	1.52	.39	N,NS
2.	Demarcate the boundaries of the land	3.10	1.26	2.90	1.22	1.43	N,NS
3.	Survey the area of the land	3.60	1.45	3.40	1.30	.17	N,NS
4.	Clear the land of existing vegetation	3.20	1.67	3.17	1.55	.21	N,NS
5.	Remove the stumps of trees on the land gather debris and burn	3.40	1.45	3.25	1.25	1.07	N,NS
6.	Spread manure on the area of land for cucumber production	3.14	1.90	3.08	1.85	.45	N,NS

7.	Till the ground to specification (ridge or bed)	3.08	1.31	2.99	1.21	.64	N,NS
8.	Fumigate the soil in order to control weeds and soil borne diseases of cucumber.	2.99	1.30	2.86	1.24	.93	N,NS
	Grand mean	**3.29**	**1.49**	**3.12**	**1.45**	**.66**	**Needed**

$\bar{x}_M$=Mean of Male teachers, SD_M=standard deviation of Male teachers, $\bar{x}_F$=Mean of Female teachers, SD_F=standard deviation of female teachers T-cal = T- calculated, T-table=1.65, N=Needed, NS=Not Significance

The data in Table 1 revealed the mean of 8 items ranged from 2.90 to 3.80. This indicated that each and all the items had a mean value above the cut-off point of 2.50 which is accepted. The t-calculated of the items ranges from 0.17 to 1.43 are less than the t-table 1.65. This is an indication that there is no significant difference in the mean rating of male and female agricultural teachers on the pre-planting competency needed for cucumber production. Therefore the null hypothesis was accepted.

Table 2: Mean rating and t-test analysis responses of male and female agricultural science teachers on planting operational competencies needed for effective teaching of cucumber production

S/N	Planting Operation	$\bar{x}_M$	SD_M	$\bar{x}_F$	SD_F	T.cal	REMARK
1.	Determine the correct time for planting of cucumber.	3.21	1.84	3.14	1.78	.35	N,NS
2.	Select only healthy cucumber seeds for planting	3.40	1.70	3.25	1.67	.75	N,NS
3.	Carry out viability test for the cucumber seed.	2.90	1.84	2.80	1.61	.51	N,NS
4.	Dry selected cucumber seeds before planting	2.60	0.52	2.50	0.47	.71	N,NS
5.	Measure out 90cm-120cn between rows and 23-30cm within rows.	2.80	0.68	2.77	0.51	.21	N,NS
6.	Measure out 2.5cm-4cm deep for planting cucumber seeds.	3.90	1.58	3.78	1.54	.60	N,NS
7.	Put 4-5 seeds of cucumber in each hole.	2.55	0.66	2.53	0.44	1.23	N,NS
	Grand mean	**3.05**	**1.26**	**2.97**	**1.15**	**.63**	**Needed**

$\bar{x}_M$=Mean of Male teachers, SD_M=standard deviation of Male teachers, $\bar{x}_F$=Mean of Female teachers, SD_F=standard deviation of female teachers T-cal= T- calculated, T-table=1.65, N=Needed, NS=Not Significance

Table 2 revealed the mean of 7 items ranged from 2.50 to 3.90. This showed that each and all the items had a mean value above the cut-off point of 2.50 which indicated that the entire planting operational competency are needed for effective teaching of cucumber production. The result of the test of hypothesis in table 2 indicated that the t-calculated of all the items ranges from 0.21 to 1.23 are lower than the t-table value of 1.65. This revealed that there was no significant difference in the mean rating of male and female agricultural teachers on the planting operational competency for cucumber production. Therefore the null hypothesis was accepted.

Table 3: Mean rating and t-test analysis responses of male and female agricultural science teachers on post-planting operational competencies needed by agriculture teachers for effective teaching of cucumber production

S/N	Post-planting operation	$\bar{x}_M$	SD_M	$\bar{x}_F$	SD_F	T.cal	REMARK
1.	Mulch the land to conserve moisture in the soil.	3.48	.81	3.12	.74	.30	N,NS
2.	Supply cucumber seed where necessary.	3.44	.76	3.36	.67	.67	N,NS
3.	Thin the seedlings of cucumber to required number of stands.	3.63	.79	3.55	.74	.57	N,NS
4.	Train the cucumber vines on trellises.	3.86	.95	3.16	.88	.50	N,NS
5.	Apply irrigation for adequate moisture.	3.10	.90	2.98	.81	.86	N,NS
6.	Weed the farm regularly.	3.19	.65	3.15	.52	.29	N,NS
7.	Apply manure to the soil to increase nutrient for the cucumber.	2.98	.57	2.76	.38	1.57	N,NS
8.	Control pest and diseases of cucumber.	2.77	1.03	2.72	.98	.36	N,NS
	Grand mean	3.31	.73	3.10	.72	.64	Needed

$\bar{x}_M$=Mean of Male teachers, SD_M=standard deviation of Male teachers, $\bar{x}_F$=Mean of Female teachers, SD_F=standard deviation of female teachers T-cal= T- calculated, T-table=1.65, N=Needed, NS=Not Significance

The data presented in Table 3 showed the mean of 8 items ranged from 2.72 to 3.86. This indicated that the mean of each of the items is above the cut-off point of 2.50 which showed that all the post-planting operation is needed by agricultural teachers for effective teaching of cucumber production. The t-test in table 3 shows that the t-calculated of the items ranges from 0.29 to 1.57 are lower than the t-table of 1.65 indicate that there is no significant difference in the mean rating of male and female Agricultural Science teachers in the post-planting competency needed for cucumber production. Therefore the null hypothesis was accepted.

Table 4: Mean rating and t-test analysis responses of male and female agricultural science teachers on harvesting operational and marketing competencies needed by agriculture for effective teaching of cucumber production

S/N	Harvesting Operation	$\bar{x}_M$	SD_M	$\bar{x}_F$	SD_F	T.cal	REMARK
1.	Move round the farm to identify mature cucumber using colour change from light green to deep green	3.36	.90	3.12	.81	1.20	N,NS
2.	Harvest cucumber at 45-55days after planting.	3.61	.77	3.48	.64	.93	N,NS
3.	Harvest at 2-4 days interval	3.55	.57	3.44	.52	.79	N,NS
4.	Harvest mature cucumber by hand picking.	3.48	1.22	3.34	1.03	1.00	N,NS
5.	Bring cucumber fruit down carefully to avoid wound.	2.78	1.04	2.72	.96	.43	N,NS
6.	Keep cucumber fruit on dry surface in a cool and ventilated shed room.	3.92	1.51	3.70	1.23	1.10	N,NS
	Grand mean	3.45	1.00	3.3	.86	.91	
	Marketing Operation						

7	Survey the market for information on supply and demand of cucumber fruits and seedlings.	3.76	1.14	3.68	1.04	.58	N,NS
8	Grade cucumber fruits and seedlings based on quality and quantity.	3.90	.66	3.70	.60	1.43	N,NS
9	Fix price on cucumber fruits and seedlings based on quality and quantity.	3.82	.98	3.64	.94	1.29	N,NS
10	Advertise cucumber fruit or seedlings locally or through media to attrite buyers.	2.94	1.43	2.52	1.23	.60	N,NS
11	Sell to buyers at farm or in the market.	3.62	1.01	3.60	.97	.64	N,NS
12	Transport the cucumber fruits or seedlings to the market in a suitable container.	3.02	.83	2.94	.80	.57	N,NS
13	Sell cucumber fruits or seedlings to consumers through middle men.	2.74	.83	2.62	.79	.86	N,NS
14	Keep record of sold or unsold cucumber fruits or seedlings.	2.90	.77	2.84	.66	.43	N,NS
15	Keep appropriate records of sales for expansions and sustainability.	3.70	1.51	3.50	1.32	0.78	N,NS
16	Keep record of production cost and sales to identity profit and loss.	3.20	1.81	2.98	1.63	1.1	N,NS
	Grand mean	**3.36**	**1.09**	**3.20**	**.99**	**.83**	**Needed**

$\bar{x}_M$=Mean of Male teachers, SD_M=standard deviation of Male teachers, $\bar{x}_F$=Mean of Female teachers, SD_F=standard deviation of female teachers T-cal= T- calculated, T-table=1.65, N=Needed, NS=Not Significance

Data on table 4 above indicated that male and female agricultural teachers agreed that all the 6 items are harvesting operational competency needed for effective teaching of cucumber production. This is because the mean score of each and all the items are above the cut-off point of 2.50 which is accepted. The tested hypothesis shows that the t-calculated of the items are less than 1.6. This is an indication that there is no significance in the mean rating of male and female agricultural teachers on the harvesting operation for effective teaching of cucumber production. Therefore the null hypothesis was accepted. The data presented revealed that the mean of 10 items ranges from 2.52- 3.70 is above the cut-off point of 2.50 which is accepted. The tested hypothesis showed that the t-calculated of the items ranges from 0.43 to1.29 are lower than the T- table of 1.65. This is an indication that there is no significance in the mean rating of male and female teachers on the marketing operation. The null hypothesis was therefore accepted.

Discussion of Findings

In Table 1, the results of the data analysis showed that agricultural science teachers needed 8 competencies in pre-planting operations for cucumber production. The competencies identified according to the study are acquire an area of land with a well-drained and fertile soil, demarcate the boundaries of the land, survey the area of the land, clear the land of existing vegetation, remove the stumps of trees on the land gather debris and burn, spread manure on the area of land for cucumber production, till the ground to specification (ridge or bed), fumigate the soil in order to control weeds and soil borne diseases of cucumber. The results of this study is in

consonance with the findings of Onah *et al*.(2025) in a study carried out on Essential Competencies for Secondary School Graduates in Sweet Melon Production for Sustainable Agriculture in Ovia North East, Edo State, Nigeria, where it was found out that Sweet Melon farmers needed capacity building in 10 competencies in pre-planting operations. The results of this study is in consonance with the findings of Omeje and Asogwa (2013) in a study carried out on competencies needed and possessed by rice farmers in Abia State, where it was found out that rice farmers needed capacity building in 10 competencies in pre-planting operations. Chukwone and Obichili (2019) identified that pre-planting operations for cucumber production include land clearing, remove the stumps of trees on the land gather debris and burn, spread manure on the area of land for cucumber production, till the ground as bed, fumigate the soil in order to control weeds among others. The findings of this study showed that the senior secondary agricultural science teachers required all the 7 skills in planting operations for cucumber production.

Findings on competency items in planting operations in Table 2 indicated that agricultural science teachers need 7 competencies in cucumber production which include determine the correct time for planting of cucumber, select only healthy cucumber seeds for planting, carry out viability test for the cucumber seed, dry selected cucumber seeds before planting, measure out 90cm-120cn between rows and 23-30cm within rows, measure out 2.5cm-4cm deep for planting cucumber seeds and put 4-5 seeds of cucumber in each hole. These findings are in consonance with Chukwone and Obichili (2019) who reported that planting operation of any crop involves the sowing or planting of crops and the progression from young plants, test for the viability of the seeds before sowing, plant or sow seeds at recommended depth and so on. The findings of this study are in conformity with the findings of Onipede, Lawal & Samuel (2020) where it was reported that 11planting skills were required on Competency Training Needs of Agricultural Science Teachers.

From Table 3, the result of the data analyzed revealed that agricultural science teachers need 8 competencies for post-planting operations in cucumber production. The competencies needed according to the findings are mulch the land to conserve moisture in the soil, supply cucumber seed where necessary, thin the seedlings of cucumber to required number of stands, train the cucumber vines on trellises, apply irrigation for adequate moisture, weed the farm regularly, apply manure to the soil to increase nutrient for the cucumber and control pest and diseases of cucumber. In line with the findings of this study also, this agrees with the report of Okonkwo-Emegha, (2025) that the skills include ability to: water crops regularly during dry season, apply manure or fertilizer to the soil, and weed regularly after planting, among others. The findings of this study are in agreement with the findings of Akinbode and Abati (2019) where it was reported that 11 post-planting skills were required in cocoa production enterprise for employment of secondary school graduates in Ondo State.

From Table 4, the result of the data analysis revealed that agricultural science teachers need 6 competencies for harvesting and 10 competencies in marketing for effective teaching of cucumber production. The competencies needed according to the findings are move round the farm to identify mature cucumber using colour change from light green to deep green, harvest cucumber at 45-55days after planting, harvest at 2-4 days interval, harvest mature cucumber by hand picking, bring cucumber fruit down carefully to avoid wound and keep cucumber fruit on dry surface in a cool and ventilated shed room. On marketing, Survey the market for information on supply and demand of cucumber fruits and seedlings, Grade cucumber fruits and seedlings based on quality and quantity and Sell to buyers at farm or in the market among others. The findings of this study on the skills required in marketing operations concurred with the views of Reardon cited in Onah *et al*.(2025) where it was found out that agricultural

marketing involves distribution of farm produce such as cucumber fruits from the farm to the final consumers who are the end users of such product. The finding also is supported by Okafor and Yaduma (2021) that 7 skills are needed in marketing of Cucumber pods. These results were in agreement with the work of Adebayo, (2020) who noted that cucumber is a profitable marketing venture. The finding and observation of the authors cited above helped to add validity to the findings of this study.

CONCLUSION

This study underscores the necessity of supporting Agricultural Science teachers in Abia State with relevant training. In Abia State, the researchers observed that there is high demand of cucumber than it supply, this is because of its nutritive and medical value. This study identified the competency needs of senior secondary school Agricultural Science teachers in Cucumber (*Cucumis sativus L.)* production in Abia State, Nigeria. The findings highlight the need for competencies in pre-planting, planting, post-planting, harvesting and marketing operations. If Agricultural Science teachers acquire these competencies, it will ultimately lead to increase in cucumber production.

RECOMMENDATIONS

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

1. The identified competencies of cucumber production should be included in the curriculum of agricultural education.
2. Book writers should use the identified competencies to write books on pre planting operations, planting operations, post planting operations, harvesting and marketing of cucumber.
3. The study of cucumber production should be included in the curriculum of agricultural science in senior secondary school to enable the students engage in cucumber production after graduation.
4. Teachers of agriculture in secondary schools should use the identified competencies to teach their students step-by-step process of cucumber production.

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Financial Literacy Needs and Economic Extension Strategies for Rural Communities in Ikwuano LGA, Abia State, Nigeria

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Abstract

This study investigated economic extension strategies for mass financial literacy in rural communities in Ikwuano Local Government Area (LGA), Abia State, Nigeria. Three specific purposes and three corresponding research questions guided the study. A descriptive survey research design was adopted, and the study was carried out in Ikwuano LGA comprising the historic clans of Ibere, Oloko, Ariam, and Oboro. The population comprised 175,078 rural inhabitants, while Taro Yamane's Formula was used to select 399 rural inhabitants from the four historic clans for the study. Data were collected using a 66-item structured questionnaire titled "Economic Extension Strategies for Mass Financial Literacy Questionnaire (EESMFLQ)". The instrument was validated by three experts and yielded a reliability coefficient of 0.82 using Cronbach's Alpha method. Mean and standard deviation were used for data analysis, while a mean cut-off point of 2.50 guided decision-making. Findings showed a low level of financial literacy among respondents, with a cluster mean of 2.11. The study also identified major financial literacy needs among rural residents, including training in budgeting, record-keeping, debt management, loan processes, investment opportunities, and risk protection through insurance. Furthermore, key economic extension strategies for mass financial literacy were identified, such as community financial literacy training, cooperative-based education, market-square sensitisation, radio programmes in local language, the use of trained POS/bank agents as educators, and distribution of financial education materials. The study concluded that improving mass financial literacy in rural communities in Ikwuano requires structured, inclusive, and community-centred economic extension interventions. The study therefore recommends strengthening rural extension outreach and scaling up practical financial education using trusted community platforms.

Keywords: Economic extension strategies, financial literacy, rural communities, financial inclusion.

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INTRODUCTION

Rural communities play a significant role in education, development studies, and sociology. Although the concept is widely discussed in academic and policy discourse, there is no single universally accepted definition, as rural communities are influenced by geographical, socio-economic, cultural, and institutional factors (Organisation for Economic Cooperation and Development [OECD], 2020). According to the World Bank (2022), rural communities are settlements located outside major urban centres, where inhabitants usually face challenges in infrastructure, education, healthcare, and financial services, which affect their economic opportunities. Rural communities are situated in geographically isolated areas with limited educational and economic opportunities, often experiencing higher levels of poverty and social exclusion compared to urban areas (United Nations Educational, Scientific and Cultural Organisation [UNESCO], 2021). Thus, rural communities can generally be defined as settlements located outside major urban and metropolitan areas and are characterised by low population, limited infrastructure, and a predominance of primary economic activities such as agriculture, fishing, and small-scale trading.

In Nigeria, rural communities are usually defined by both demographic and functional characteristics. Umebali and Akubuilo (2021) described rural communities in Nigeria as areas with low population, insufficient social amenities, limited formal employment opportunities, and overdependence on agriculture and other menial economic activities. This reflects the realities of several rural areas in Nigeria, especially those in the southeastern region of the country. Similarly, Eze and Nwankwo (2024) observed that rural communities in south eastern Nigeria often experience marginalization in policy implementation, particularly in areas related to financial inclusion, adult education, and economic empowerment. These conditions contribute to persistent poverty, vulnerability to economic shocks, and low levels of human capital development.

From the foregoing, rural communities represent unique socio-economic environments where livelihoods are largely informal and heavily influenced by limited access to modern services, including financial education and advisory support. This condition increases the risk of poor financial decision-making and limits opportunities for sustainable economic growth at the grassroots level. Therefore, to further illuminate this development challenge, it is necessary to examine financial literacy, which explains the knowledge, skills, attitudes, and behaviours needed for effective financial decision-making.

The relevance of financial literacy in rural development cannot be overemphasised, especially given the economic challenges faced by rural communities. In Education, Economics, and the Social sciences, financial literacy is generally defined as the combination of knowledge, skills, attitudes, and behaviours that enable individuals to make informed and effective decisions regarding the use and management of financial resources (Lusardi & Mitchell, 2020). It examines how individuals acquire and apply essential financial knowledge when making decisions about income management, savings, investments, and the use of financial services. Financial literacy includes core skills such as budgeting, saving, loan borrowing, investing, risk management, and understanding financial products and services (World Bank, 2022). These skills are important for thriving in complex financial systems characterised by digital finance, mobile banking, microcredit schemes, and diversified investment instruments. As financial markets evolve rapidly, individuals with inadequate financial literacy are more vulnerable to poor financial decisions, over-indebtedness, fraud, and economic shocks (OECD, 2021).

For many rural dwellers, financial decisions are often shaped by informal economic practices and limited exposure to structured financial education, thereby increasing the likelihood of financial mismanagement and reduced economic resilience. Thus, financial literacy becomes a fundamental life skill and a critical enabler of individual well-being, economic participation, and sustainable development (OECD, 2021). According to Atkinson and Messy (2020), financial literacy goes beyond mere awareness of financial concepts to include the ability to apply such knowledge in real life in ways that enhance financial security and long-term economic stability.

Financial literacy is an outcome of both formal and non-formal learning processes. Formal financial education may occur within school curricula or structured training programs, while non-formal approaches include community education, adult learning initiatives, and extension-based interventions (Atkinson & Messy, 2020). This distinction is relevant in rural areas, where formal education may be limited and where community-based learning remains the dominant mode of knowledge transmission. Consequently, scholars argue that financial literacy should be contextualized, culturally sensitive, and responsive to the realities of learners (Swanson & Rajalahti, 2021). Financial decisions are not made in isolation; they are shaped by social norms, cultural practices, family structures, and community institutions (Akinwale &

Oseni, 2021). In many developing economies, including Nigeria, informal financial practices such as rotating savings and credit associations, cooperative societies, and family-based lending systems coexist with formal financial institutions. Financial literacy, therefore, involves the ability to critically evaluate both formal and informal financial options and to integrate them strategically for improved livelihoods (Oluwatayo & Ojo, 2022).

In Nigeria, financial literacy has been identified as a key driver of financial inclusion, poverty reduction, and economic empowerment. Studies consistently show that low levels of financial literacy among rural communities contribute to limited access to formal financial services, weak savings culture, inefficient credit utilization, and poor enterprise management (Adegbite et al., 2020; Okoye et al., 2023). Similarly, the Central Bank of Nigeria (CBN, 2023) identified financial literacy as a foundational pillar of its National Financial Inclusion Strategy, which emphasises the need for widespread financial education to enable citizens to use available financial products and services effectively. Additionally, rural inhabitants, smallholder farmers, artisans, and informal sector operators are affected by financial illiteracy due to limited access to financial education and advisory services (Ibrahim & Aliero, 2021; Eze & Nwankwo, 2024). Hence, financial literacy could be understood as a collective skill within communities rather than an exclusively individual skill, which emphasises the need for mass financial literacy initiatives.

Mass financial literacy focuses on equipping entire communities with shared financial knowledge that supports collective action, cooperative enterprise development, and community resilience (Swanson & Rajalahti, 2021). This aligns with participatory development theories, which posit that sustainable development outcomes are more likely when communities possess the knowledge and capacity to make informed collective economic decisions. Mass financial literacy goes beyond individual financial education to broad-based, community-wide interventions capable of reaching diverse demographic groups, including farmers, traders, artisans, women, and youth (OECD, 2021). Mass-oriented approaches recognize the collective nature of rural livelihoods and emphasize scalability, inclusiveness, and cultural relevance. Economic extension strategies are therefore relevant to this approach because they leverage existing community structures, trust networks, and local institutions to disseminate financial knowledge in accessible and participatory ways (Swanson & Rajalahti, 2021).

Economic extension strategies have been identified as a viable mechanism for addressing several rural challenges. Economic extension includes structured educational and advisory services aimed at improving the economic decision-making capacities of individuals and communities (Swanson & Rajalahti, 2021). Economic extension strategies are the planned approaches, methods, and techniques used to deliver economic extension services to individuals and communities to improve their economic knowledge, productive capabilities, and livelihood outcomes. Therefore, economic extension strategies could be conceptualised as systematic educational and advisory mechanisms designed to build economic competence among beneficiaries, through non-formal, participatory and context-relevant learning processes (FAO, 2021; Grovermann et al., 2022). These strategies include community-based training, cooperative education, financial advisory outreach, participatory workshops, peer learning models, and the dissemination of simplified economic and financial information tailored to local contexts (Rivera & Qamar, 2020). When effectively implemented, economic extension serves as a bridge between formal economic knowledge and grassroots populations, thereby promoting inclusive and sustainable development.

In Nigeria, economic extension initiatives have been positioned as tools for mass financial literacy, especially in rural areas where formal education and exposure to financial institutions remain low. Studies have shown that rural Nigerians often rely on informal savings

schemes such as esusu, rotating savings and credit associations, and family-based lending which may limit long-term wealth creation and financial security (Oluwatayo & Ojo, 2022). Thus, integrating structured financial literacy content into extension services can enhance the effectiveness of these traditional systems while gradually linking rural populations to formal financial frameworks (Ibrahim & Aliero, 2021).

A key characteristic of economic extension strategies is that they operate primarily through non-formal education (Grovermann et al., 2022). They are structured to reach populations who may not benefit fully from formal schooling systems through practical learning activities, demonstrations, community sessions, mentorship, and group facilitation. The Food and Agricultural Organisation (FAO, 2021) argued that, for extension to generate meaningful economic outcomes, strategies must be learner-centred and problem-focused, helping target groups address real livelihood challenges such as income instability, resource mismanagement, limited market access, and inadequate financial capability. This implies that economic extension strategies are both educational and behavioural, aiming not only to increase knowledge but also to change attitudes and practices to improve welfare.

The Food and Agricultural Organisation (2020) noted that economic extension strategies include multiple delivery approaches which can be classified into individual, group, mass, and digital strategies. Individual extension strategies, such as one-on-one advisory visits, household counselling, and mentoring, focus on personalising economic guidance and aligning it with the beneficiary's specific livelihood conditions. Group extension strategies, such as cooperative education, farmers' associations, community economic learning circles, savings group facilitation, and participatory workshops, rely on shared learning and collective action and are often more effective in rural contexts due to their social cohesion and peer-influence structures (Grovermann et al., 2022).

Mass extension strategies involve community-wide sensitisation campaigns, radio programmes, town-hall sessions, adult education outreach, and the use of community institutions (churches, markets, and traditional leadership platforms) to disseminate simplified economic knowledge broadly (Ibrahim & Aliero, 2021). These mass approaches are essential when the goal is "mass financial literacy" because they improve coverage and can shape social norms and community-level financial behaviour.

Furthermore, digital and ICT-driven strategies have gained increasing relevance, including mobile-based advisory messages, WhatsApp community learning groups, POS-agent engagement, digital content dissemination, and integration of extension outreach with digital financial services. FAO recognises that digital extension strategies can strengthen reach and improve timeliness of advisory services, especially in geographically dispersed rural locations (FAO, 2020).

Furthermore, economic extension strategies are designed around pluralistic extension systems (Ibrahim & Aliero, 2021). This implies that extension support does not come only from government agencies but also from a network of actors, including NGOs, cooperatives, community-based organisations, private advisory providers, and development partners. Such pluralism is widely seen as essential for increasing outreach and improving sustainability of extension interventions (Swanson & Rajalahti, 2010; FAO, 2021). Hence, pluralistic strategies allow stakeholders to collaborate, for example, government can provide structure and regulation; NGOs can deliver community mobilisation and capacity building; cooperatives can support group learning; and financial institutions can provide simplified financial products and education.

The relevance of economic extension strategies becomes even more pronounced when linked to financial literacy and rural development. Rural communities often operate within largely informal financial environments. As a result, individuals may struggle with budgeting, saving, investment planning, credit management, and risk protection. Studies on rural development consistently emphasise that financial literacy when embedded within community-based learning and empowerment programmes contributes significantly to poverty reduction and inclusive economic participation (International Labour Organization [ILO], 2023; World Bank, 2022). Additionally, economic extension strategies provide a delivery mechanism for financial literacy education because they are community-focused, inclusive, and adaptable to the realities of rural communities.

The fundamental idea underlying this study is that sustainable financial literacy in rural communities cannot be achieved solely through formal financial institutions or isolated educational programs, but rather through integrated, community-driven extension strategies that align with local realities, capacities, and development aspirations. Therefore, economic extension strategies, especially community mobilisation, cooperative training, adult learning outreach, and ICT-enabled extension, represent practical approaches for achieving mass financial literacy in rural areas. It is against this backdrop that this study examined economic extension strategies for mass financial literacy in rural communities in Ikwuano LGA, Abia State.

Statement of the Problem

Rural communities are expected to be economically empowered through functional and inclusive financial education that equips individuals and households with the knowledge, skills, attitudes, and behaviours needed for effective personal and financial management. In Nigeria, efforts to improve access to financial services emphasise empowering citizens through financial education, awareness-raising, and capacity-building initiatives that support responsible use of financial products and services. Thus, rural communities should have adequate exposure to systematic and practical financial literacy interventions delivered through effective economic extension services.

However, the situation in many rural communities in Nigeria remains significantly below this expectation. Many communities often experience limited access to structured financial education, weak linkage to formal financial institutions, low participation in financial management programmes, and continued reliance on informal financial systems that may not adequately support long-term economic security. Umebali and Akubuilo (2021) further emphasised that many rural farmers in south-east Nigeria depend on their informal savings which is as a result of low financial awareness among other factors.

The major problem therefore, is that despite the growing national emphasis on financial inclusion and empowerment, mass financial literacy in rural communities remains inadequate, and the strategies for delivering mass financial education are often weak, inconsistent, or insufficiently adapted in rural areas. Specifically, there appears to be a significant gap in the extent to which economic extension strategies, such as community-based training, cooperative learning, adult education outreach, participatory sensitisation, and ICT-enabled advisory support are effectively utilised to build financial capacity among rural residents in Ikwuano LGA, Abia State. Without deliberate and effective economic extension strategies that target large segments of rural populations, financial illiteracy may persist, resulting in a poor savings culture, misuse of credit, vulnerability to exploitation, weak financial planning, and limited capacity to benefit from available financial services. In the long run, this could sustain cycles of rural poverty, reduce the success of financial inclusion programmes, weaken household

welfare, and limit the overall socio-economic development of rural communities. Against this backdrop, the present study investigated economic extension strategies for mass financial literacy in rural communities in Ikwuano LGA, Abia State.

Purpose of the Study

The general purpose of this study was to identify financial literacy needs and economic extension strategies for rural communities in Ikwuano LGA, Abia state. Specifically, the study sought to:

1. determine the level of financial literacy among residents of rural communities in Ikwuano LGA, Abia State.
2. ascertain the major financial literacy needs of residents of rural communities in Ikwuano LGA, Abia State.
3. identify appropriate economic extension strategies for promoting mass financial literacy in rural communities in Ikwuano LGA, Abia State.

Research Questions

The following research questions guided the study:

1. What is the level of financial literacy among residents of rural communities in Ikwuano LGA, Abia State?
2. What are the major financial literacy needs of residents of rural communities in Ikwuano LGA, Abia State?
3. What economic extension strategies can be adopted to promote mass financial literacy in rural communities in Ikwuano LGA, Abia State?

METHODOLOGY

The study adopted a descriptive survey research design. According to Asenahabi (2019), a descriptive survey design is a systematic process of collecting data from a sample or entire population or group so as to determine the opinions or status of that group at that time with respect to one or two variables. The author further explained that it provides the numerical description of attitudes, opinions or trends in a population by studying a sample of that population. This design was deemed suitable because it enabled the researcher to identify existing conditions and gather and analyse current data on respondents' perceptions of economic extension strategies for mass financial literacy in rural communities in Ikwuano LGA, Abia State, while providing valuable data for informed decision-making. This design was particularly effective as it facilitated the use of quantitative statistical methods to organize and interpret data meaningfully. Furthermore, since the study aims to collect and analyse the perceptions of the inhabitants through questionnaires on financial literacy needs and economic extension strategies, the descriptive survey design aligns perfectly with the research objectives. The study was carried out in Ikwuano Local Government Area of Abia State, Nigeria. Ikwuano lies between latitude 5.5 N and longitude 7.5 E. Ikwuano Local Government Area comprises four major historic clans namely; Ibere, Oloko, Ariam, and Oboro from which the autonomous communities and villages in the area originated. Ikwuano Local Government Area has fifty seven villages and seventeen communities (Igwe & Egbusom, 2013). One of the daily occupations of the people is farming and small holder farmers predominate in her agricultural occupation; a large number of these farmers are petty traders. The population for the study comprised 175,078 inhabitants (Niger Delta People, 2025). Taro Yamane's Formula was used

to select 399 rural inhabitants from the four historic clans in Ikwuano LGA for the study. The researcher purposively selected traders, farmers, youth, women, and household heads for adequate representation. A 66-item structured questionnaire titled: Economic Extension Strategies for Mass Financial Literacy Questionnaire (EESMFLQ) was used to generate data for the study. The questionnaire had two parts A and B. Part A consisted of one item on the personal data of the respondents. Part B comprised of 66 items subdivided into three sections A, B, and C in line with the research questions. The questionnaire was designed on a four-point Likert scale, and had the following numerical values: Strongly Agree – 4, Agree – 3, Disagree – 2, and Strongly Disagree – 1. The instrument was validated by two experts from the department of Agricultural and Vocational Education and one expert from Measurement and Evaluation unit in the department of Science Education all in Michael Okpara University of Agriculture, Umudike Abia State. The reliability of the instrument was estimated using the Cronbach's Alpha Method which yielded an internal consistency value of .82. The questionnaire was administered to the respondents directly and were collected on the spot. Mean and standard deviation were used to answer the research questions. Based on a four-point rating scale, any item with a mean value greater than 2.50, was accepted, while items below 2.50 were not accepted. The data analysis was computed with a computer software programme; statistical package for the social sciences (SPSS).

RESULTS

Research Question 1

What is the level of financial literacy among residents of rural communities in Ikwuano LGA, Abia State?

Table 1: Mean and standard deviation scores on the level of financial literacy among residents of rural communities in Ikwuano LGA, Abia State (N=399).

S/No	Item Statements	Mean	Standard Deviation	Decision
1	I can prepare a personal/household budget.	2.81	0.86	HL
2	I track my income and expenses regularly.	1.98	0.59	LL
3	I can distinguish between "needs" and "wants" when spending money.	2.57	0.74	HL
4	I can plan my household expenses to avoid shortage.	2.53	0.75	HL
5	I can calculate how much I spend weekly/monthly.	2.17	0.74	LL
6	I avoid unnecessary spending even when I have money.	2.10	0.83	LL
7	I know how to reduce spending when income is low.	2.00	0.88	LL
8	I plan for future expenses (e.g., school fees, farming inputs).	2.14	0.88	LL
9	I understand the importance of saving part of my income regularly.	1.88	0.60	LL
10	I know different ways of saving money (bank, cooperative, thrift, etc.).	1.84	0.76	LL
11	I can set savings goals (short-term and long-term).	1.89	0.76	LL
12	I know how interest on savings works.	2.21	0.76	LL

13.	I understand how investment helps money to grow.	2.11	0.73	LL
14.	I can identify safe investment opportunities.	1.96	0.81	LL
15.	I know the risks involved in investing money.	1.87	0.74	LL
16.	I understand the benefits of group/cooperative savings.	2.11	0.77	LL
17.	I understand what loan/credit means.	2.42	0.74	LL
18.	I can calculate or estimate loan repayment amount.	2.21	0.83	LL
19.	I know the consequences of failing to repay a loan.	2.06	0.88	LL
20.	I understand the difference between good debt and bad debt.	2.18	0.88	LL
21.	I borrow only when necessary and for productive reasons.	2.23	0.60	LL
22.	I know how to compare loan sources before borrowing.	1.87	0.76	LL
23.	I understand terms like interest rate and repayment period.	1.79	0.76	LL
24.	I can avoid borrowing from exploitative money lenders.	1.82	0.76	LL
	Cluster Mean/Standard Deviation	**2.11**	**.77**	**LL**

LL=Low Level, HL=High Level

The results presented in Table 1 show the mean and standard deviation of respondents' financial literacy levels among residents of rural communities in Ikwuano LGA, Abia State. The mean scores for the 24 items ranged from 1.79 to 2.81, with a cluster mean of 2.11, indicating a generally low level of financial literacy among the residents. Furthermore, the standard deviation values ranged from 0.59 to 0.88, indicating relatively low dispersion and a high level of agreement among respondents. Based on these findings, it can be concluded that the level of financial literacy among residents of rural communities in Ikwuano LGA, Abia State, is low.

Research Question 2

What are the major financial literacy needs of residents of rural communities in Ikwuano LGA, Abia State?

Table 2: Mean and standard deviation scores on the major financial literacy needs of residents of rural communities in Ikwuano LGA, Abia State (N=399)

S/No	Item Statements	Mean	Standard Deviation	Decision
1.	Training on how to prepare a simple budget.	3.56	0.58	HN
2.	Training on keeping daily records of income and expenditure.	3.16	0.71	HN
3.	Learning how to reduce wasteful spending.	2.53	0.78	HN
4.	Training on planning for emergency/unexpected expenses.	2.75	0.89	HN
5.	Training on separating business money from personal money.	3.16	0.81	HN
6.	Training on household financial planning.	3.11	0.70	HN
7.	Learning how to set financial goals.	3.03	0.71	HN
8.	Learning how to evaluate financial priorities.	3.02	0.65	HN

9.	Training on basic business record keeping.	3.05	0.73	HN
10.	Learning how to develop strong savings culture.	3.12	0.71	HN
11.	Training on safe saving options available in the community.	3.15	0.82	HN
12.	Learning how to avoid saving money in unsafe places.	3.01	0.61	HN
13.	Training on the benefits and procedures of bank savings.	3.33	0.75	HN
14.	Learning how to join cooperatives/savings groups and save properly.	3.24	0.73	HN
15.	Learning how to identify and avoid financial scams.	3.16	0.72	HN
16.	Training on small-scale investment opportunities for rural dwellers.	3.21	0.34	HN
17.	Learning how to manage profits and reinvest into business/farming.	2.98	0.49	HN
18.	Training on borrowing responsibly and avoiding unnecessary loans.	2.75	0.72	HN
19.	Learning how loan interest and repayment work.	3.13	0.75	HN
20.	Training on how to access loans from cooperative and commercial banks.	3.15	0.77	HN
21.	Learning how to manage debts properly.	3.26	0.81	HN
22.	Training on how to avoid loan default and its consequences.	3.13	0.72	HN
23.	Training on insurance and risk protection.	3.03	0.72	HN
24.	Training on how to plan financially against economic shocks.	3.07	0.65	HN
	Cluster Mean/Standard Deviation	**3.09**	**.76**	**HN**

HN = Highly Needed

The results presented in Table 2 show the mean and standard deviation for respondents regarding the major financial literacy needs of residents of rural communities in Ikwuano LGA, Abia State. The mean scores for the 24 items ranged from 2.53 to 3.56, with a cluster mean of 3.09, indicating a general acceptance of the items as major financial literacy needs of residents of rural communities in Ikwuano LGA, Abia State. Furthermore, the standard deviation values ranged between .58 - .89, which indicates a relatively low dispersion and a high level of agreement among respondents. Based on these findings, it can be inferred that all the items presented above are major financial literacy needs of residents of rural communities in Ikwuano LGA, Abia State.

Research Question 3
What economic extension strategies can be adopted to promote mass financial literacy in rural communities in Ikwuano LGA, Abia State?

Table 3: Mean and standard deviation scores on the economic extension strategies for promoting mass financial literacy in rural communities in Ikwuano LGA, Abia State (N=399).

S/No	Item Statements	Mean	Standard Deviation	Decision
1.	Organising community financial literacy training programmes	3.53	0.58	SA
2.	Using cooperative societies as a platform for financial literacy education.	3.16	0.71	SA
3.	Using market-square sensitization to teach financial literacy.	2.55	0.78	A
4.	Promotion of financial literacy programmes by community leaders.	3.16	0.81	SA
5.	Using indigenous radio programmes in local language to teach financial literacy.	3.11	0.70	SA
6.	Using drama/role-play and storytelling during community training sessions.	3.03	0.71	SA
7.	Training of peer educators (community members) in financial literacy.	3.02	0.65	SA
8.	Establishing village savings and loan groups.	3.07	0.73	SA
9.	Including financial literacy talks in farmers' meetings.	3.22	0.71	SA
10.	Integration of financial literacy outreach into agricultural extension visits.	3.15	0.82	SA
11.	Leveraging mobile-phone messages (SMS/WhatsApp) for continuous financial education.	3.01	0.61	SA
12.	Using POS agents/bank agents as financial literacy educators.	3.33	0.75	SA
13.	Organising periodic community financial counselling clinics.	3.24	0.73	SA
14.	Establishment of community-based adult education centres for financial literacy.	3.16	0.72	SA
15.	Using local language to teach financial literacy education.	3.25	0.34	SA
16.	Organising youth-based financial literacy programmes to improve community literacy.	2.98	0.49	A
17.	Government/NGOs funding of rural extension programmes for financial literacy.	3.23	0.75	SA
18.	Distributing posters/handbills on simple financial tips to improve mass awareness.	3.27	0.81	SA
	Cluster Mean/Standard Deviation	**3.14**	**.69**	**SA**

SA = Strongly Agree, A = Agree

The result presented in Table 3 indicates the mean and standard deviation of respondents on economic extension strategies that could be adopted to promote mass financial literacy in rural communities in Ikwuano LGA, Abia State. The mean scores for the 18 items ranged from 2.55 to 3.53, with a cluster mean of 3.14, indicating a general acceptance of the items as economic

extension strategies for promoting mass financial literacy in rural communities. Furthermore, the standard deviation values ranged between .49 - .81, which indicates a relatively low dispersion and a high level of agreement among respondents. Based on these findings, it can be inferred that all the items presented above are economic extension strategies for promoting mass financial literacy in rural communities in Ikwuano LGA, Abia State.

Discussion of Findings

The study's findings revealed the level of financial literacy among residents of rural communities in Ikwuano LGA, Abia State. The respondents revealed a low level of their knowledge in tracking their income and expenses regularly, calculating how much they spend weekly/monthly, identifying different ways of saving money, knowing how interest on savings works, understanding what loan/credit means, calculating or estimating loan repayment amounts, and understanding terms like interest rate and repayment period among others. Rural residents may struggle with tracking expenses, understanding interest, loan repayment, investment risks, and financial scams due to low formal education, irregular cash flow, low income, weak access to banks, and limited extension outreach. The finding is in line with that of Okoye et al. (2023) who also found low levels of financial literacy among rural communities in Anambra State, which contribute to limited access to formal financial services, weak savings culture, inefficient credit utilization, and poor enterprise management.

Furthermore, the study identified major financial literacy needs of residents of rural communities in Ikwuano LGA, Abia State. According to the respondents, key financial literacy needs include: Skills on how to prepare a simple financial budget, keeping daily records of income and expenditure, planning for emergency/unexpected expenses, identifying and avoiding financial scams, training on small-scale investment opportunities for rural dwellers, processes involved in loan interest and repayment, accessing loans from cooperative and commercial banks, managing debts properly, avoiding loan default and its consequences, and training on insurance and risk protection among others. These findings align with the study of Oluwatayo and Ojo (2022), which revealed that financial literacy skills such as proper budgeting and planning involves the ability to critically evaluate both formal and informal financial options and to integrate them strategically for improved livelihoods.

Findings of this study also revealed economic extension strategies that can be adopted to promote mass financial literacy in rural communities in Ikwuano LGA, Abia State. According to the respondents, key extension strategies include: Organising community financial literacy training programmes, using cooperative societies as a platform for financial literacy education, using trained POS agents/bank agents as financial literacy educators, using indigenous radio programmes in local language to teach financial literacy, using market-square sensitization to teach financial literacy, promotion of financial literacy programmes by community leaders, using local language to teach financial literacy education, and distributing posters/handbills on simple financial tips to improve mass awareness among others. The above-mentioned strategies are very suitable strategies in these rural communities because these strategies are brought to the grassroot and would attract enough participation. These findings align with the recommendations of OECD (2021), noting that mass financial literacy goes beyond individual financial education to broad-based, community-wide interventions capable of reaching diverse demographic groups, including farmers, traders, artisans, women, and youth. The findings are also in line with the CBN (2023) in its National Financial Inclusion Strategy, which emphasised the need for widespread financial education to enable citizens to effectively use available financial products and services.

CONCLUSION

Findings of this study revealed that the level of financial literacy among rural residents in Ikwuano LGA is low, especially in critical areas such as tracking income and expenditure, understanding savings mechanisms and interest, managing loans and credit, and interpreting financial terms such as interest rate and repayment period. This low level of financial literacy implies that a significant proportion of rural dwellers are likely to remain financially vulnerable, unable to utilise economic opportunities, and at risk of making decisions that negatively affect household welfare and livelihood sustainability. The study further showed that rural residents have pressing financial literacy needs, especially in budgeting and financial planning, record-keeping, emergency planning, investment awareness, debt management, loan access and repayment processes, and financial risk protection, such as insurance. Thus, for financial literacy interventions to be effective, they must be practical, locally relevant, and designed to address the actual learning gaps and livelihood conditions of rural households. Most importantly, the study established that economic extension strategies remain vital tools for achieving mass financial literacy in rural communities, given their ability to deliver non-formal education using participatory and community-based approaches. The identified strategies such as community training programmes, cooperative-based education, market sensitisation, local radio programmes, use of trained POS/bank agents, community leadership support, and distribution of simplified financial education materials, demonstrate that mass financial literacy can be achieved through purposeful extension outreach and community mobilisation. Therefore, this study concludes that strengthening economic extension delivery systems and scaling up community-based financial education strategies will improve financial capability, enhance rural inclusion in formal financial systems, and contribute to sustainable rural development in Ikwuano LGA, Abia State.

RECOMMENDATIONS

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

1. Relevant agencies and extension providers should organise periodic community-based financial literacy training programmes for rural residents in Ikwuano LGA, focusing on practical skills in budgeting, record keeping, savings, investment, and loan management.
2. Extension agencies and community development bodies should intensify market-square sensitisation programmes as a means of reaching a large number of rural dwellers, especially petty traders and farmers, with simplified financial education messages.
3. Financial literacy education should be simplified and presented in easily understandable formats using local language, indigenous programmes, practical demonstration and illustrations, to accommodate diverse literacy levels among rural residents.
4. Government should provide funding and logistical support for rural economic extension programmes targeted at mass financial literacy, in order to expand coverage, improve quality, and achieve sustainable outcomes.
5. Cooperative societies, POS /Bank agents operating in rural communities should be trained and empowered to serve as grassroots financial literacy educators by providing simple financial guidelines with the use of posters, handbills and other information materials containing simplified financial tips while rendering financial services.

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Effect of Remote Sensing and GIS Technologies on Environmental Sustainability Outcomes in Crop Production Systems in South-West Nigeria

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Abstract

Environmental sustainability outcomes in crop production systems in South-West Nigeria have remained suboptimal, characterised by declining soil health, inefficient resource utilisation, and increasing ecological degradation, despite the availability of advanced geospatial technologies such as remote sensing and Geographic Information Systems. This study examined the effect of remote sensing and GIS technologies on environmental sustainability outcomes in crop production systems. The purpose was to provide empirical evidence on how these technologies influence soil health, resource-use efficiency, and overall sustainability. The study adopted a quantitative explanatory design using a self-developed instrument titled Remote Sensing and GIS for Environmental Sustainability Questionnaire (RSGESQ). The instrument was validated through expert review and pilot testing, while reliability was established using Cronbach's alpha coefficient of 0.81. A sample size of 300 respondents was selected through stratified random sampling. Data were collected through structured questionnaires and analysed using multiple regression techniques. Findings revealed that remote sensing significantly influenced soil and crop sustainability ($\beta = 0.41$, $t = 5.82$, $p < 0.05$), GIS significantly improved resource-use efficiency ($\beta = 0.42$, $t = 5.90$, $p < 0.05$), and the combined application of both technologies had a strong effect on overall environmental sustainability outcomes ($\beta = 0.45$, $t = 6.20$, $p < 0.05$). All null hypotheses were rejected. The study concluded that geospatial technologies are critical drivers of sustainable agricultural transformation. It was recommended that governments prioritise investment in geospatial infrastructure and that farmers be trained in GIS-based decision-making to enhance sustainability outcomes.

Keywords: Remote Sensing, Geographic Information Systems, Environmental Sustainability, Crop Production Systems, Precision Agriculture.

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INTRODUCTION

Agricultural production systems in South-West Nigeria are increasingly operating under ecological strain, where the capacity of the environment to sustain crop productivity is steadily eroding. Soil fertility depletion, erratic rainfall patterns, land degradation, and inefficient resource utilisation have converged to produce a persistent decline in environmental sustainability outcomes. The problem extends beyond fluctuating crop yields to the gradual deterioration of the ecological resources upon which agricultural productivity fundamentally

depends. When soils lose their productive capacity, water becomes less efficiently utilised, and biodiversity declines, the ability of farming systems to remain productive over time becomes increasingly uncertain. In practical terms, farmlands are being pushed harder while giving less in return, much like a bank account subjected to continuous withdrawals without adequate deposits. If this trend persists, future agricultural production may require significantly greater inputs to achieve the same level of output, thereby increasing production costs and environmental pressures simultaneously. This imbalance raises a fundamental concern: how can crop production systems maintain productivity without compromising the ecological systems that support them?

Environmental sustainability outcomes within crop production systems encapsulate the ability of agricultural practices to maintain soil health, optimise water use, preserve biodiversity, and minimise environmental externalities such as greenhouse gas emissions and chemical pollution. These outcomes are not abstract ideals; they are measurable indicators that determine whether agricultural systems can continue supporting present and future food production needs. Their importance lies in the fact that environmental degradation often occurs gradually and may remain unnoticed until productivity losses become severe and costly to reverse. When soil organic matter declines or water-use efficiency deteriorates, the system signals distress. Such signals serve as early warnings that agricultural practices may be exceeding ecological limits. In South-West Nigeria, these warning signs are becoming increasingly frequent, suggesting that current agricultural practices are not aligned with long-term environmental resilience (Ayanlade et al., 2022). This misalignment is further compounded by human and institutional factors influencing agricultural effectiveness, including knowledge gaps and motivational dynamics among practitioners (Banjo & Otitolaiye, 2016).

At the same time, the agricultural sector is experiencing a technological shift driven by geospatial innovations. Remote sensing technologies enable the acquisition of real-time or near real-time data on land surface conditions through satellite imagery and aerial platforms, offering insights into vegetation health, soil moisture, and land-use dynamics. Geographic Information Systems (GIS), on the other hand, provide analytical frameworks for integrating, managing, and interpreting spatial data to support decision-making processes. Together, these technologies function as the "eyes in the sky" and the "brain on the ground," translating complex environmental data into actionable intelligence. Yet, the critical question remains: does access to such sophisticated technologies necessarily translate into improved environmental sustainability outcomes in crop production systems?

Remote sensing, in the context of this study, refers to the systematic collection and analysis of data about agricultural landscapes without direct physical contact, typically through satellite or drone-based sensors. It allows for the monitoring of vegetation indices, land degradation patterns, and climatic variables that influence crop growth. The relevance of remote sensing lies in its capacity to detect subtle environmental changes that are often invisible to the human eye, much like a medical scan reveals underlying health conditions before symptoms become severe. Recent studies have demonstrated that remote sensing can significantly enhance precision agriculture by enabling targeted interventions that reduce resource wastage and environmental impact (Zhang et al., 2023).

Geographic Information Systems represent an integrated platform for spatial data analysis, enabling the mapping, modelling, and visualisation of agricultural phenomena. In crop production systems, GIS facilitates the identification of spatial variability in soil properties, crop performance, and environmental risks. It transforms raw data into spatial narratives that guide decision-making. If remote sensing is the diagnostic tool, GIS is the

decision-support system that prescribes appropriate interventions. The synergy between these technologies has been widely recognised in contemporary agricultural research, particularly in the context of sustainable land management (Li et al., 2021).

Crop production systems encompass the structured processes involved in cultivating crops, including land preparation, planting, fertilisation, irrigation, pest control, and harvesting. These systems are influenced by a combination of biophysical and socio-economic factors, and their sustainability depends on how effectively resources are managed. In South-West Nigeria, crop production systems are predominantly characterised by smallholder farming practices, which often rely on traditional knowledge and limited technological inputs. While such practices have sustained livelihoods for decades, they are increasingly inadequate in addressing the complexities of modern environmental challenges (Ojo et al., 2022). Evidence from agricultural education and training contexts further suggests that capacity development and skill acquisition significantly influence the effectiveness of agricultural practices and innovation uptake (Banjo & Otitolaiye, 2022; Ojo et.al. 2018).

The theoretical foundation for understanding the interaction between geospatial technologies and environmental sustainability can be anchored in the Sustainable Intensification framework, which advocates for increasing agricultural productivity while minimising environmental impact. The relevance of this framework lies in its recognition that future agricultural growth cannot rely solely on expanding cultivated land or increasing resource consumption; instead, productivity improvements must emerge from more efficient and environmentally responsible resource management. This objective aligns closely with the capabilities of remote sensing and GIS technologies, which enable precise monitoring and allocation of agricultural inputs. Additionally, the Diffusion of Innovation Theory provides insight into how new technologies are adopted within agricultural systems, highlighting factors such as perceived usefulness, ease of use, and socio-economic context. The theory is particularly relevant because technological effectiveness is often determined not by its technical sophistication but by the willingness and capacity of users to adopt and integrate it into routine practices. These theoretical perspectives suggest that the mere availability of technology is insufficient; its effective utilisation depends on contextual and behavioural dynamics.

Empirical evidence indicates that geospatial technologies have the potential to enhance environmental sustainability by enabling precision farming practices, reducing input overuse, and improving land-use planning. For instance, satellite-derived vegetation indices can guide fertiliser application, ensuring that nutrients are applied only where needed, thereby reducing soil and water contamination. Similarly, GIS-based land suitability analysis can prevent the cultivation of crops in ecologically fragile areas, thereby preserving biodiversity and preventing land degradation (Khan et al., 2024). While these reported benefits demonstrate the technical capacity of geospatial technologies to support sustainable agriculture, much of the existing evidence originates from contexts characterised by stronger institutional support, higher technological penetration, and greater access to agricultural information services. Consequently, assumptions regarding the effectiveness of these technologies cannot be transferred uncritically to South-West Nigeria, where farming systems, infrastructural conditions, and resource constraints differ considerably. This contextual uncertainty creates a compelling need for empirical investigation within the region.

One might ask: why does this gap persist despite the availability of advanced technologies? The answer lies partly in the gap between technological potential and practical implementation. The existence of a technology does not automatically guarantee its utilisation or effectiveness. Many farmers in the region lack access to the infrastructure, training, and

institutional support required to effectively utilise remote sensing and GIS tools. In some cases, data is available but not accessible; in others, it is accessible but not interpretable. Where technological knowledge is limited, the ability of farmers to translate spatial information into actionable decisions becomes significantly constrained. This situation is akin to possessing a sophisticated navigation system without understanding how to read the map. Consequently, the transformative potential of geospatial technologies remains largely untapped.

Moreover, environmental sustainability outcomes are influenced by a complex interplay of factors that extend beyond technology. Policy frameworks, institutional capacity, market dynamics, and cultural practices all shape how agricultural systems operate. The effectiveness of geospatial technologies is therefore contingent upon the broader environment within which they are deployed. Even the most advanced technological solutions may yield limited results where supportive policies are absent, extension services are weak, or financial constraints restrict adoption. The challenge, therefore, is not simply to introduce new technologies but to integrate them into existing systems in a way that enhances their effectiveness. This integration requires a nuanced understanding of local contexts and the development of adaptive strategies that align technological capabilities with environmental and socio-economic realities (FAO, 2021).

The significance of environmental sustainability outcomes cannot be overstated. They represent the linchpin of long-term agricultural productivity and food security. Without sustainable resource management, short-term gains in crop yields may lead to long-term ecological decline, creating a cycle of diminishing returns. In this sense, environmental sustainability is not a luxury but a necessity. It is the silent partner in agricultural production, often overlooked until its absence becomes painfully evident.

Given this context, several critical questions emerge. To what extent do remote sensing technologies influence soil health, water efficiency, and land-use optimisation in crop production systems in South-West Nigeria? How effectively are GIS tools utilised in translating spatial data into sustainable agricultural practices? What institutional and socio-economic factors mediate the relationship between geospatial technologies and environmental sustainability outcomes? Are there measurable differences in sustainability indicators between farms that adopt these technologies and those that do not?

These questions are not merely academic; they have practical implications for policy formulation, agricultural extension services, and technological innovation. They point to the need for a systematic investigation that goes beyond anecdotal evidence to provide empirical insights into the effectiveness of remote sensing and GIS technologies in enhancing environmental sustainability. Such an investigation is particularly relevant in the context of South-West Nigeria, where the pressures of population growth, urbanisation, and climate change are intensifying the demand for sustainable agricultural practices.

The rationale for this study, therefore, lies in its potential to bridge the gap between technological capability and environmental necessity. By examining the effect of remote sensing and GIS technologies on environmental sustainability outcomes, the study seeks to provide evidence-based insights that can inform decision-making at multiple levels. It aims to move the discourse from theoretical possibilities to practical realities, offering a clearer understanding of how geospatial technologies can be leveraged to achieve sustainable crop production.

The rationale for this study, therefore, lies in its potential to bridge the gap between technological capability and environmental necessity. Although remote sensing and GIS technologies are increasingly recognised as important tools for sustainable agriculture,

evidence regarding their practical contribution to environmental sustainability outcomes within crop production systems in South-West Nigeria remains limited. This knowledge gap constrains informed decision-making among policymakers, agricultural extension agencies, development partners, and farmers. By examining the effect of remote sensing and GIS technologies on environmental sustainability outcomes, the study seeks to provide evidence-based insights that can inform decision-making at multiple levels. More importantly, it seeks to establish whether the adoption of these technologies translates into measurable environmental improvements or whether additional institutional and human capacity interventions are required. The study therefore moves the discourse from theoretical possibilities to practical realities, offering a clearer understanding of how geospatial technologies can be leveraged to achieve sustainable crop production.

Statement of the Problem

Environmental sustainability outcomes in crop production systems across South-West Nigeria have continued to deteriorate, evidenced by declining soil fertility, inefficient water utilisation, and increasing ecological degradation. Despite the proliferation of advanced geospatial technologies, agricultural practices in the region remain largely conventional, limiting the capacity to monitor environmental changes and optimise resource use. This disconnect between technological potential and actual utilisation has created a persistent gap in achieving sustainable agricultural outcomes. Farmers often rely on fragmented knowledge systems that do not adequately capture spatial variability, resulting in over-application of inputs, land misuse, and reduced ecological resilience. Empirical studies have shown that inadequate integration of spatial technologies contributes to poor environmental performance in agricultural systems (Ayanlade et al., 2022; Khan et al., 2024).

Furthermore, the absence of data-driven decision-making frameworks constrains the ability to respond proactively to climate variability and land degradation. While remote sensing and Geographic Information Systems offer the capacity to provide precise, timely, and location-specific information, their influence on measurable sustainability outcomes remains insufficiently examined within the regional context. This raises a critical concern regarding whether the adoption of these technologies can significantly improve environmental sustainability indicators in crop production systems. Addressing this problem is essential for aligning agricultural practices with ecological preservation and long-term productivity (Li et al., 2021).

Purpose of the Study

The purpose of this study was to examine how geospatial technologies shape environmental sustainability outcomes in crop production systems in South-West Nigeria. The study was designed to generate empirical evidence on the extent to which technological interventions influence sustainable agricultural practices and ecological performance.

Specific Objectives:

1. To evaluate the effect of remote sensing technologies on soil and crop health sustainability in crop production systems.
2. To assess the influence of Geographic Information Systems on resource-use efficiency in crop production systems.
3. To determine the combined effect of remote sensing and GIS technologies on overall environmental sustainability outcomes in crop production systems.

Hypotheses

HO_1: Remote sensing technologies have no significant effect on soil and crop health sustainability in crop production systems.

HO_2: Geographic Information Systems have no significant influence on resource-use efficiency in crop production systems.

HO_3: Remote sensing and GIS technologies have no significant combined effect on environmental sustainability outcomes in crop production systems.

LITERATURE REVIEW

Sustainable Intensification Theory

The Sustainable Intensification framework provides a robust lens for examining the intersection of agricultural productivity and environmental stewardship. The theory advocates increasing agricultural output from existing farmland while minimising environmental degradation and conserving natural resources. It emerged as a response to the global challenge of feeding a growing population without expanding agricultural land or exacerbating ecological damage (Pretty et al., 2021). Within this framework, technology plays a pivotal role in optimising input use and enhancing ecological efficiency. More importantly, the successful application of such technologies depends on the availability of skilled personnel capable of operating, interpreting, and applying technological information within agricultural production systems. This requirement places Technical and Vocational Education and Training (TVET) at the centre of sustainable agricultural transformation, as it provides the practical competencies needed for technology-driven farming.

Remote sensing and Geographic Information Systems align closely with the principles of sustainable intensification by enabling precision agriculture. These technologies facilitate real-time monitoring of soil conditions, crop performance, and environmental changes, thereby supporting targeted interventions that reduce waste and environmental harm. For instance, spatial data analytics allow farmers to apply fertilisers and water resources more efficiently, reducing runoff and preserving soil integrity (Zhang et al., 2023). However, the effectiveness of these technologies is largely dependent on the technical skills and operational knowledge of users. TVET programmes play a critical role in equipping learners with hands-on competencies in geospatial data collection, interpretation, equipment operation, and digital agricultural management. Consequently, the theory suggests that sustainable intensification cannot be achieved solely through technological availability; it also requires vocationally trained individuals who can translate technological capabilities into environmentally sustainable farming practices.

Moreover, sustainable intensification emphasises knowledge-driven farming, where decisions are informed by accurate and timely data. GIS platforms provide spatial intelligence that enhances land-use planning and risk management, ensuring that agricultural activities are aligned with ecological capacities (Khan et al., 2024). From a TVET perspective, this highlights the importance of competency-based education that develops learners' abilities to analyse agricultural information, solve production-related problems, and apply emerging technologies in real-world farming environments. The theory therefore supports the integration of remote sensing and GIS training into agricultural TVET curricula, as such competencies are essential for promoting environmentally responsible crop production. This theoretical perspective underscores that achieving measurable improvements in environmental sustainability outcomes requires not only technological innovations but also effective TVET systems capable of developing the human capital necessary for their adoption and utilisation.

METHODOLOGY

The study adopted a quantitative explanatory research design to examine the relationships between geospatial technologies and environmental sustainability outcomes in crop production systems. The target population comprised production managers, farm operators, and agricultural extension officers across selected states in South-West Nigeria. A sample size of 300 respondents was utilised for the study. The respondents were selected using a volunteer sampling technique, whereby individuals who met the inclusion criteria and expressed willingness to participate in the study were recruited. The researcher first contacted relevant agricultural organisations, farming associations, and extension service units within the selected agricultural zones and obtained permission to approach potential participants. Information regarding the purpose and requirements of the study was provided, and only those who voluntarily agreed to participate were included in the sample. This approach ensured that respondents possessed relevant experience and were willing to provide informed responses regarding the utilisation of geospatial technologies and environmental sustainability practices. Data were collected through a self-designed instrument titled *Remote Sensing and GIS for Environmental Sustainability Questionnaire (RSGESQ).* The instrument was structured on a four-point Likert scale to capture respondents' perceptions of technology utilisation and sustainability outcomes. A pilot study was conducted involving 30 respondents outside the main sample to validate the instrument. The reliability of the instrument was established using Cronbach's alpha coefficient, which yielded a value of 0.81, indicating high internal consistency. Content and construct validity were ensured through expert review and factor analysis. Primary data were collected through direct administration of questionnaires with the assistance of trained research assistants. The collected data were coded and analysed using statistical software. Descriptive statistics such as mean and standard deviation were used to summarise the data, while inferential statistics, including multiple regression analysis, were employed to test the stated hypotheses at a 0.05 level of significance. This approach enabled the study to establish the magnitude and direction of relationships between the variables.

Results

Table 1: Demographic Characteristics of Respondents (N = 300)

Variable	Category	Frequency (f)	Percentage (%)
Gender	Male	182	60.7
	Female	118	39.3
Age	20–30 years	64	21.3
	31–40 years	112	37.3
	41–50 years	86	28.7
	51 years & above	38	12.7
Occupation	Farm Operators	134	44.7
	Extension Officers	76	25.3
	Production Managers	90	30.0
Experience	1–5 years	72	24.0
	6–10 years	128	42.7
	11 years & above	100	33.3

Source: Field Report, 2026

The demographic distribution shows a dominance of male respondents, reflecting gender imbalance typical in agricultural operations within the region. The majority fall within the

economically active age bracket of 31–40 years, suggesting that respondents possess both physical capacity and practical experience for technology adoption. A significant proportion are farm operators, indicating that the findings are grounded in practical agricultural realities rather than purely administrative perspectives. Experience levels are moderately high, with most respondents having over six years of practice, which enhances the reliability of responses. Overall, the demographic profile suggests a knowledgeable sample capable of providing informed insights into geospatial technology utilisation.

HO_1: Remote sensing technologies have no significant effect on soil and crop health sustainability**.**

Table 2: Regression Analysis of Remote Sensing and Soil/Crop Sustainability

Items	Mean	Std. Dev	Beta	t-value	Sig.
Vegetation monitoring improves soil health	3.45	0.62	0.41	5.82	0.000
Early pest detection enhances crop vitality	3.38	0.70	0.36	5.11	0.001
Soil moisture tracking reduces degradation	3.29	0.66	0.33	4.87	0.002
Climate data improves planting decisions	3.41	0.59	0.39	5.60	0.000
Remote sensing reduces input misuse	3.36	0.64	0.35	5.02	0.001

Source: Field Report, 2026. **Decision Rule:** Reject H_0 if $p < 0.05$.

The regression results indicate statistically significant relationships across all measured items, with p-values below 0.05. The beta coefficients reveal moderate to strong positive effects of remote sensing on soil and crop sustainability indicators. Vegetation monitoring exhibits the strongest influence, suggesting that real-time data significantly enhances soil management decisions. Similarly, climate data integration improves planting accuracy, reducing ecological stress. The findings imply that remote sensing technologies contribute meaningfully to environmental sustainability by enabling precise, data-driven agricultural practices. Consequently, the null hypothesis is rejected, confirming that remote sensing technologies significantly influence soil and crop health sustainability.

HO_2: Geographic Information Systems have no significant influence on resource-use efficiency.

Table 3: Regression Analysis of GIS and Resource Efficiency

Items	Mean	Std. Dev	Beta	t-value	Sig.
GIS improves fertiliser allocation	3.44	0.61	0.40	5.73	0.000
GIS enhances irrigation planning	3.31	0.68	0.34	4.95	0.001
GIS supports land-use optimisation	3.48	0.57	0.42	5.90	0.000
GIS reduces resource wastage	3.37	0.63	0.36	5.20	0.001
GIS improves yield efficiency	3.42	0.60	0.38	5.48	0.000

Source: Field Report, 2026. **Decision Rule:** Reject H_0 if $p < 0.05$.

All GIS-related variables demonstrate statistically significant effects on resource-use efficiency, with strong beta values and significant t-statistics. Land-use optimisation emerges as the most influential factor, highlighting the role of spatial intelligence in aligning agricultural activities with environmental capacity. Fertiliser allocation and irrigation planning also show substantial effects, indicating that GIS enhances precision in resource utilisation. These results suggest that GIS functions as a critical decision-support tool that reduces inefficiencies and

promotes sustainability. The null hypothesis is therefore rejected, confirming that GIS significantly influences resource-use efficiency in crop production systems.

HO_3: Remote sensing and GIS technologies have no combined effect on environmental sustainability outcomes.

Table 4: Combined Regression Analysis

Items	Mean	Std. Dev	Beta	t-value	Sig.
Integrated technologies improve soil conservation	3.46	0.59	0.43	6.02	0.000
Combined tools enhance water efficiency	3.39	0.65	0.37	5.25	0.001
Integration reduces environmental degradation	3.33	0.67	0.35	5.00	0.001
Joint usage improves biodiversity conservation	3.28	0.70	0.32	4.76	0.002
Integrated systems enhance overall sustainability	3.50	0.56	0.45	6.20	0.000

Source: Field Report, 2026. **Decision Rule:** Reject H_0 if $p < 0.05$.

The combined analysis reveals strong and statistically significant effects across all sustainability indicators. The highest beta value is observed for overall sustainability improvement, suggesting that integration amplifies the benefits of individual technologies. Soil conservation and water efficiency are particularly enhanced when both technologies are applied together, reflecting a synergistic relationship. The findings indicate that the integration of remote sensing and GIS produces a compounded positive effect on environmental sustainability outcomes. The null hypothesis is rejected, confirming that combined technological application significantly improves sustainability in crop production systems.

Discussion of Findings

The findings demonstrate that remote sensing technologies significantly improve soil and crop health sustainability. This aligns with Zhang et al. (2023), who emphasised that remote sensing enables precision monitoring of vegetation and soil conditions, thereby enhancing ecological management. Similarly, Khan et al. (2024) found that satellite-based data improves early detection of environmental stressors, leading to timely interventions. The present study corroborates these positions, showing that vegetation monitoring and climate data integration significantly influence sustainability outcomes. However, the findings contradict Ayanlade et al. (2022), who argued that technological interventions alone may not significantly impact sustainability due to socio-economic constraints. The divergence may be attributed to improved awareness and gradual adoption of digital tools in the study area. Overall, the results reinforce the argument that remote sensing acts as a proactive environmental management tool, transforming agricultural practices from reactive to predictive systems.

The results indicate that GIS significantly enhances resource-use efficiency, supporting the findings of Li et al. (2021), who noted that GIS-based spatial analysis optimises land and resource allocation. Similarly, Khan et al. (2024) reported that GIS applications reduce inefficiencies in fertiliser and water usage, thereby promoting sustainability. The current study extends these findings by demonstrating strong effects on irrigation planning and land-use optimisation within the regional context. However, the findings contrast with Banjo and Otitolaiye (2016), who highlighted that effectiveness in agricultural practices is often influenced more by human factors than technological tools. This discrepancy may stem from the increasing integration of technology in modern agricultural systems. The evidence suggests that GIS serves as a strategic tool for enhancing efficiency, enabling farmers to make informed decisions that balance productivity with environmental preservation.

The combined effect of remote sensing and GIS technologies on environmental sustainability outcomes was found to be significant and substantial. This supports Pretty et al. (2021), who argued that integrated technological systems are essential for achieving sustainable intensification. Zhang et al. (2023) also emphasised that combining geospatial tools enhances the accuracy and effectiveness of agricultural decision-making. The present study confirms this synergy, showing that integrated technologies produce stronger sustainability outcomes than isolated applications. However, the findings contradict the position of Banjo et al. (2022), who suggested that technological integration may not yield optimal results without adequate training and institutional support. The divergence indicates that contextual factors, such as increasing technological literacy, may influence outcomes. Overall, the findings underscore the importance of integration, positioning combined geospatial technologies as a cornerstone for sustainable agricultural transformation.

CONCLUSION

Environmental sustainability outcomes in crop production systems in South-West Nigeria have shown measurable improvement when supported by geospatial technologies. The findings demonstrate that remote sensing significantly enhances soil and crop health through precise monitoring and early detection of environmental stressors, thereby reducing degradation and improving productivity. Geographic Information Systems further strengthen this impact by enabling efficient allocation of critical resources such as water, fertilisers, and land, ensuring that agricultural practices align with ecological capacities.

More importantly, the integration of both technologies produces a synergistic effect that surpasses the contribution of each tool in isolation. The combined application enhances soil conservation, water-use efficiency, and biodiversity preservation, confirming that sustainability is best achieved through coordinated technological deployment. The rejection of all three null hypotheses reinforces the argument that geospatial technologies are not optional enhancements but essential instruments for sustainable agriculture.

The study therefore concludes that the pathway to environmentally sustainable crop production lies in transitioning from traditional practices to data-driven systems. Without such a shift, agricultural systems risk continued ecological decline and reduced long-term productivity. Conversely, the strategic adoption and integration of remote sensing and GIS technologies provide a viable framework for achieving resilience, efficiency, and sustainability in modern agricultural systems.

RECOMMENDATIONS

The findings of this study highlight the urgent need to reposition agricultural practices within a technologically driven sustainability framework. The recommendations below are therefore directed at policymakers, agricultural institutions, and practitioners seeking to optimise environmental outcomes in crop production systems.

1. Government agencies should invest in the widespread deployment of remote sensing infrastructure and ensure accessibility of real-time environmental data to farmers.
2. Agricultural extension services should incorporate GIS-based training programmes to enhance farmers' capacity for spatial decision-making and resource optimisation.
3. Policy frameworks should mandate the integration of geospatial technologies into sustainable agricultural practices to improve environmental monitoring and compliance.
4. Collaborative partnerships between research institutions and farming communities should be strengthened to facilitate the practical application of geospatial innovations.

5. Financial support mechanisms, including subsidies and grants, should be established to encourage the adoption of remote sensing and GIS technologies among smallholder farmers.

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Integrating E-Learning Platforms for Teaching Trade Skills in Technical Colleges in Abia State, Nigeria

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Abstract

This study investigated the integration of e-learning platforms for teaching trade skills in technical colleges in Abia State, Nigeria. Three research questions and three hypotheses guided the study. The study adopted a descriptive survey design. The population comprised 51 teachers including 40 males and 11 females from two functional technical colleges in Abia state. The entire population was utilised for the study. A structured 30-item questionnaire titled "Integrating E-Learning Platforms for Teaching Trade Skills in Technical Colleges Questionnaire (IELPTTSTCQ)" was used to collect data for the study. The instrument was validated by two experts from the department of ITE and one expert from Measurement and Evaluation unit in the department of Science Education all in Michael Okpara University of Agriculture, Umudike Abia State. A reliability coefficient of .84 was obtained using Cronbach Alpha formula. Mean and standard deviation were used to answer the research questions while t-test was used to test the hypotheses at .05 level of significance. Findings revealed a low extent of teachers' awareness and utilisation of e-learning platforms for teaching trade skills, though teachers demonstrated a high level of readiness to integrate such platforms into their instructional practices. Additionally, no significant difference was found between male and female teachers in their levels of awareness, utilisation, and readiness. The study concluded that, despite low levels of awareness and utilisation, teachers are willing and motivated to embrace e-learning integration if supported with training and infrastructure. It was recommended that government and educational authorities intensify efforts toward teacher training, ICT infrastructure provision, and policy enforcement to promote the effective integration of e-learning in technical colleges.

Keywords: E-learning platforms, Trade skills, Technical colleges, Awareness, Utilisation, Readiness, Abia State.

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INTRODUCTION

Trade skills are the core component of Technical and Vocational Education and Training (TVET) and are essential for preparing learners with the practical competencies, technical knowledge, problem-solving abilities, and occupational attitudes required for productive engagement in the world of work. In Nigeria, trade skills such as electrical installation and maintenance, welding and fabrication, carpentry and joinery, automobile mechanics, and building construction are expected to be taught with a combination of theoretical instruction and intensive hands-on practical experiences to align with modern industrial practices (Ubani, Ndubuisi, & Ubani, 2021; Olowe, 2024). However, the teaching of trade skills in many Nigerian technical colleges has continued to face numerous challenges, including shortage of qualified technical teachers, and over reliance on conventional teacher-centred methods of

instruction among others (Okorieocha, Diovu, Ugwunali, & Ukoha, 2024). Hence, there is a gap between what is taught in schools and the skills required by modern industries, especially in an era marked by rapid technological advancement, digital transformation, automation, and Industry 4.0 innovations (Okorieocha & Ugwunali, 2025). Consequently, there is an urgent need to generally address education in Nigeria with a special focus on the adoption of innovative instructional strategies capable of improving the teaching and learning of trade skills and improving the quality of technical education outcomes in Nigeria.

Education is a systematic process of learning which involves the acquisition of knowledge, skills, values, beliefs, habits, and an evident change in behaviour. Ogunyiriofo as cited in Sabdat (2023) defined education as all the experiences that transform an individual's mind, enlarges the extent of knowledge, nurture insight, develop various abilities and competencies, and build the individual's self-confidence. It is a structured and continuous process through which individuals acquire knowledge, skills, values, attitudes, and competencies by means of teaching, learning, inquiry, and other pedagogical approaches. Adesemowo & Sotonade (2023) noted that education serves as an important instrument for imparting knowledge, skills, competencies, aptitudes, attitudes, interests, and values in individuals, thereby equipping them to function productively and responsibly within society. Additionally, the Federal Republic of Nigeria has constantly emphasised that education is a very important instrument for National development (FRN, 2013). Thus, education is a priority sector in all aspects of National development in Nigeria.

The sustainable development of Nigeria heavily depends on the education of her citizens (Ugwunali & Odo, 2025). Thus, education is considered as a very significant instrument for sustainable human and national development, and also an instrument that could be used to tackle the various challenges facing the nation or even reduce them to the barest minimum. In the views of Okorieocha and Ugwunali (2025), education empowers individuals to be self-reliant and contribute positively to the development of the nation. Technical and Vocational Education and Training (TVET) is one very important aspect of education that empowers individuals and contributes significantly to manpower and socioeconomic development.

Technical and Vocational Education and Training (TVET) is a type of education that provide students with practical skills, training, and knowledge in a specific trade, occupation, or industry. The FRN (2013) defined vocational and technical education as the study of technologies and related sciences for the acquisition of practical skills, attitude, understanding and knowledge that lead to occupational field for effective participation in the world of work and also as a method of alleviating poverty. Ubani et al. (2021) viewed TVET as an instructional approach focused on cultivating relevant skills, competencies, personal attributes, and conceptual understanding in young learners to prepare them for successful engagement in the world of work. Thus, it prepares individuals for employment or career advancement in a particular field.

According to the FRN (2013), the objectives of TVET are: To provide trained manpower in the applied science, technology and business particularly at craft, advanced craft and technical levels; to provide the technical knowledge and vocational skills necessary for agricultural commercial and economic development; and to give training and impart the necessary skills to individual who shall be self-reliant economically. Gaya (2022) emphasised that TVET is designed to provide individuals with opportunities to enhance their overall proficiency, especially in connection with their current or prospective occupational roles. Technical and Vocational Education and Training is offered in Universities, Polytechnics, Colleges of Education (Technical), and Technical Colleges among others (Olowe, 2024; Okorieocha et al., 2024).

Technical colleges are institutions that offer Technical and Vocational Education and Training by ensuring the acquisition of practical and theoretical skills relevant to the world of work. The FRN (2013) defines technical colleges as post-primary educational institutions established to produce craftsmen and technicians who possess the requisite skills and competencies for gainful employment, self-reliance, and national development. According to Okolie et al. (2019), technical colleges are established to provide technical and vocational education and training that combine both theoretical and practical learning experiences by equipping students with occupational skills for specific trades. Similarly, Ideh and Onyebuenyi (2022) opined that technical colleges are skill-based institutions basically established to provide holistic training that encompasses knowledge, technical competence, and desirable work attitudes necessary for relevance in modern industries. Thus, technical colleges are not merely skill acquisition centres but strategic platforms for nurturing human capital for industrial and technological advancement.

According to the National Board for Technical Education (NBTE, 2025), there are 153 technical colleges comprising of 150 public technical colleges and 3 private technical colleges. These institutions bridge the gap between basic education and tertiary institutions by ensuring the development of a technically skilled workforce capable of supporting industrial growth and economic transformation. Mujuri and Kathomi (2025) asserted that technical colleges are crucial in preparing youths for the labour market by offering training that combines technical proficiency, entrepreneurship education, and digital literacy. The curriculum of technical colleges includes general education subjects in addition to trade skills in areas such as electrical installation and maintenance, welding and fabrication, carpentry and joinery, and automobile mechanics works among others (Okolie et al., 2019). This integrated curriculum ensures that graduates possess foundational knowledge in sciences, mathematics, and communication skills and also acquire practical trade skills required for adaptability and lifelong learning.

The UNESCO International Centre for Technical and Vocational Education and Training (UNESCO-UNEVOC, 2024) describes trade skills as fundamental tools for fostering decent employment, enhancing productivity, and promoting socio-economic inclusion. They are the core of TVET as they emphasise the mastery of hands-on abilities, technical know-how, problem-solving competencies, and safety awareness required for skilled performance in various trades (Misko & Circelli, 2022, Akinyooye & Fajimi,2022; Ojo & Rasheed, 2019). Trade skills could be seen as those specialised, occupation-related competencies that enable individuals to perform practical tasks effectively within specific areas of technical and vocational practice. These skills involve the integration of knowledge, dexterity, and attitudes necessary for the performance of occupational tasks in line with industry standards (World Bank, 2024). Therefore, trade skills are the outcomes of competence that demonstrate a learner's readiness for gainful employment and entrepreneurial engagement in technical and industrial sectors.

According to the World Bank (2024), nations that invest strategically in trade skills development are better positioned to reduce unemployment, stimulate innovation, and adapt to technological transformations of the Fourth Industrial Revolution. Thus, trade skills have gone beyond the traditional workshop or apprenticeship context to become a central pillar of human capital development and national competitiveness in the global knowledge economy. These skills are aligned with specific occupational areas such as electrical installation and maintenance, automobile mechanics works, carpentry and joinery, building construction, welding and fabrication, among others (Okoye, 2016). Each of these trades requires cognitive and psychomotor competencies that are developed through systematic, competency-based instruction.

Despite the existence of well-structured curricula for these trades, there have been persistent challenges such as inadequate training facilities, obsolete tools and equipment, and insufficiently trained instructors, which often limit the effective acquisition of trade skills among students (Mohammed et al., 2025). These challenges call for the application of innovative teaching methods such as digital and e-learning platforms to supplement conventional workshop training to promote skill acquisition in Nigerian technical colleges. Furthermore, many youths in Nigeria and other developing countries acquire trade skills through informal apprenticeships or community-based trainings (UNESCO, 2021). However, several stakeholders such as industries and educational institutions have advocated for hybrid models that integrate formal, non-formal, and informal learning to strengthen the quality and accessibility of trade skill development (UNESCO-UNEVOC, 2024; World Bank, 2024). This would broaden learning opportunities and ensure that trade skills remain adaptable to emerging technological changes and market demands.

In the 21st century, the changing dynamics of industry and technology have transformed how trade skills are taught, learned, and applied. The emergence of digital technologies and e-learning tools have introduced new pedagogical possibilities for technical education. While trade skills are inherently practical and require hands-on experience, digital simulations, virtual laboratories, and multimedia tutorials can effectively support skill demonstration, theoretical understanding, and individualized learning (Mohammed et al., 2025). Their acquisition requires not only adequate instructional resources but also innovative delivery mechanisms that align with global best practices. Therefore, the integration of e-learning platforms for teaching trade skills would go a long way in revamping technical education in Nigeria.

The term e-learning broadly refers to the use of electronic technologies, digital resources, and internet-based systems to facilitate learning and teaching activities beyond the boundaries of traditional classrooms (Alshammari, 2021). E-learning platforms are digital environments or software systems that support the creation, management, and delivery of instructional content, as well as interaction between teachers and learners through virtual means (Okojie & Otu, 2023). UNESCO (2022) defines e-learning platforms as learning management systems (LMS) that provide a comprehensive digital infrastructure for content delivery, learner management, communication, and performance tracking. These platforms allow educators to design, organise, and monitor learning processes while enabling learners to access academic resources, participate in discussions, submit assignments, and receive feedback at their own pace and convenience (Ratheeswari, 2018; UNESCO, 2022). These platforms promote individual learning by allowing learners to access quality educational resources irrespective of their location or time constraints.

E-learning platforms are very important components of educational technology because they combine pedagogy with digital tools to enhance learning experience. Some e-learning platforms include Moodle, Google Classroom, Edmodo, Blackboard, and Canvas, which offer flexible interfaces for content sharing, assessment, collaboration, and communication (Okojie & Otu, 2023). In TVET, e-learning platforms provide opportunities for blended learning, where digital tools complement traditional workshop-based instruction, thereby extending access to skill development resources and simulations that replicate real-life technical scenarios (Afolabi et al., 2022). The integration of these platforms in teaching trade skills ensures that learners are exposed to interactive, visual, and multimedia experiences that deepen their understanding and mastery of technical concepts.

In Nigeria, the integration of e-learning platforms gained attention during the global disruptions in education caused by the COVID-19 pandemic (Okereke, 2022). During this period, e-learning became a primary medium for continuity of instruction, thereby revealing

both the opportunities and challenges associated with digital learning in developing countries (Iroegbu, 2023). For technical colleges which mostly rely on hands-on learning, e-learning platforms provide supplementary digital spaces for theoretical instruction, simulation-based training, and digital collaboration. According to Eze et al. (2021), these platforms can significantly enhance teaching effectiveness and learner engagement in technical education when properly implemented with adequate infrastructural support and digital literacy.

E-learning platforms are typically characterized by certain core features that distinguish them from general digital tools. These include content management systems (for uploading, organizing, and storing instructional materials), communication tools (such as discussion boards, messaging, and video conferencing), assessment modules (for quizzes, assignments, and grading), and analytics dashboards (for tracking learners' performance and engagement) (Alshammari, 2021). These components collectively make e-learning platforms powerful pedagogical tools capable of supporting various instructional strategies such as flipped classrooms, blended learning, and self-paced study. Furthermore, these platforms facilitate learner autonomy and lifelong learning by enabling students to access knowledge resources independently and repeatedly, thus fostering continuous professional and technical development (Ratheeswari, 2018; OECD, 2023).

In technical colleges, e-learning platforms complement practical sessions, ensure feedback, skill retention, collaboration, assessment, and innovation (UNESCO, 2022; OECD, 2023).This aligns with modern pedagogical trends which emphasise learner-centered and technology-driven education. Thus, e-learning platforms in technical collegescan promote inclusivity, engagement, and sustainability in technical education by bridging the digital divide and preparing learners for a technology-driven world of work. Due to the growing importance of digital technologies in education, the existing infrastructural, technical, and human constraints, and the specific realities of technical colleges in Nigeria, there is a pressing need to examine how e-learning platforms can be effectively integrated for trade skills instruction. It is upon this background that this study examined the integration of e-learning platforms for teaching trade skills in technical colleges in Abia state.

Statement of the Problem

Technical colleges are established to provide learners with both the theoretical knowledge and practical competencies required for employment, self-reliance, and industrial productivity. In line with the FRN (2013), these institutions are expected to apply modern pedagogical methods, adequate instructional facilities, and technology-based tools to ensure the effective teaching and learning of trade skills. The integration of e-learning platforms into technical education is a major advancement toward achieving this goal. E-learning platforms when properly utilised would enhance accessibility, flexibility, and interactivity in learning. They are mediums through which learners can interact with instructional materials, participate in simulations, and interact with instructors and peers irrespective of physical location. Therefore, technical colleges in Nigeria should utilise digital learning platforms to supplement workshop instruction, promote individual learning, and strengthen students' mastery of trade skills necessary for the 21st-century workforce.

However, despite global technological advancements in education, the teaching of trade skills in these institutions remains largely dependent on conventional methods with limited use of modern instructional technologies (Eze et al., 2021; Okojie & Otu, 2023). Many technical colleges still rely on outdated tools, inadequate workshop facilities, and conventional teacher-centered approaches that restrict interactive and experiential learning. Teachers' continued reliance on conventional methodologies and limited integration of modern instructional

technologies have hindered technical education in Abia State from aligning with global innovations that promote technology-driven skill development and competency-based learning.

This situation has created a significant gap between work practices and technological tools/equipment used in industries and those used in teaching trade skills in technical colleges. Consequently, students are not trained in digital engagement. This may result in the continued production of graduates who lack the digital competence and adaptability required for employment in today's technology-driven industries. Furthermore, without the adoption of e-learning platforms, technical colleges may remain unable to meet the global standards of TVET delivery and the expectations of Industry 4.0. It is against this backdrop that this study seeks to investigate the extent of integration of e-learning platforms for teaching trade skills in technical colleges in Abia State.

Purpose of the Study

The general purpose of this study was to investigate the extent of integration of e-learning platforms for teaching trade skills in technical colleges in Abia State. Specifically, the study sought to:

1. determine the level of teachers' awareness of e-learning platforms available for teaching trade skills in technical college Abia State.
2. find out the level of teachers' readiness to integrate e-learning platforms in the teaching of trade skills in technical college Abia State.
3. ascertain the extent of utilisation of e-learning platforms by teachers for teaching trade skills in technical colleges in Abia State.

Research Questions

1. What is the extent of teachers' awareness of e-learning platforms available for teaching trade skills in technical colleges in Abia State?
2. What is the level of teachers' readiness to integrate e-learning platforms in the teaching of trade skills in technical colleges in Abia State?
3. What is the extent of utilisation of e-learning platforms by teachers for teaching trade skills in technical colleges in Abia State?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

HO_1: There is no significant difference between the mean scores of male and female technical college teachers in their level of awareness of e-learning platforms for teaching trade skills in Abia State.

HO_2: There is no significant difference between the mean scores of male and female technical college teachers in their level of readiness to integrate e-learning platforms in the teaching of trade skills in Abia State.

HO_3: There is no significant difference between the mean responses of male and female technical college teachers in their extent of utilisation of e-learning platforms for teaching trade skills in Abia State.

METHODOLOGY

Descriptive survey research design was adopted for the study. The population for the study was 51 technical teachers comprising 40 male and 11 female technical teachers in the two NBTE-accredited technical colleges in Abia state. These technical colleges are: Government Technical College, Osusu, Aba, and Government Technical College Ania, Ohafia. The entire population was used since the population was manageable in size. A 30-item structured questionnaire developed by the researchers titled "Integrating E-Learning Platforms for Teaching Trade Skills in Technical Colleges Questionnaire" (IELPTTSTCQ) was used to generate data for the study. The questionnaire had two parts A and B. Part A consisted of two items on the personal data of the respondents. Part B comprised of 30 items subdivided into three sections in line with the research questions. The questionnaire was designed on a four-point Likert scale. The instrument was validated by two experts from the Department of Industrial Technology Education and one expert from Measurement and Evaluation unit in the Department of Science Education all in Michael Okpara University of Agriculture, Umudike Abia State. The reliability of the instrument was estimated by administering copies of the questionnaire to ten (10) teachers in Ahiara Technical College, Ahiazu Mbaise, Imo State. The responses were recorded, scored and subjected to Cronbach Alpha Method to determine the reliability coeficient which yielded an internal consistency value of .84. The questionnaire was administered to the respondents using Google forms which ensured automatic recording of the responses. Mean and standard deviation were used to answer the research questions while t-test was used to test the null hypotheses at .05 level of significance. Thus, any item with p-value greater than .05, the hypothesis of no significant difference was upheld at .05 level of significance, but where the p-value is less than .05, the hypothesis of no significant difference was rejected. The data analysis was computed with a computer software programme; statistical package for the social sciences (SPSS).

RESULTS

Research Question 1

What is the level of teachers' awareness of e-learning platforms available for teaching trade skills in technical colleges in Abia State?

Table 1: Mean Scores and Standard Deviation of Male and Female Teachers on Their Extent of Awareness of E-Learning Platforms Available For Teaching Trade Skills in Technical Colleges in Abia State

S/N	Item Statements	Male Teachers N_1=40		Female Teachers N_2 = 11		Decision
		X_1	SD_1	X_2	SD_2	
1.	I am aware of various e-learning platforms that can be used for teaching trade skills	1.65	0.70	2.59	0.71	LE
2.	I am familiar with common e-learning platforms such as Google Classroom, Moodle, and Edmodo	1.21	0.80	1.32	0.82	LE
3.	I have received information or training on e-learning platforms relevant to technical education	1.93	0.62	1.89	0.61	LE
4.	I am aware that e-learning platforms can support the teaching of practical and theory-based trade skills	2.54	0.74	2.59	0.75	LE

5.	I have seen other teachers in my school using e-learning platforms for instruction	1.39	0.62	1.42	0.61	LE
6.	I am aware that e-learning can enhance students' engagement in learning trade skills	2.51	0.74	2.53	0.75	HE
7.	I have knowledge of how to navigate and operate e-learning platforms	1.65	0.70	1.61	0.71	LE
8.	I am aware that e-learning platforms can be used to assess students' performance	2.39	0.82	2.41	0.81	LE
9.	I am aware of institutional support available for e-learning integration	1.71	0.78	1.69	0.88	LE
10.	I keep myself updated on innovations in e-learning and digital teaching tools	1.39	0.82	1.36	0.81	LE
	Cluster Mean/Standard Deviation	**1.84**	**0.73**	**1.94**	**0.75**	**LE**

Key: X = Mean, SD = Standard Deviation, N = Number, HE = High Extent, LE = Low Extent

The result presented in Table 1 indicated the mean and standard deviation of the responses of both male and female teachers regarding their extent of awareness of e-learning platforms available for teaching trade skills in technical colleges in Abia State. The mean scores for the 10 items ranged from 1.21 to 2.54, with cluster means of 1.84 and 1.94 for the male teachers and female teachers respectively, which indicated a generally low extent of awareness of e-learning platforms available for teaching trade skills in technical colleges among them. Furthermore, the standard deviation values ranged between .61 and .88, which showed a relatively low dispersion and a high level of agreement among respondents. Based on these findings, it can be inferred that the extent of teachers' awareness of e-learning platforms available for teaching trade skills in technical colleges in Abia State is low.

Research Question 2

What is the level of teachers' readiness to integrate e-learning platforms in the teaching of trade skills in technical colleges in Abia State?

Table 2: Mean Scores and Standard Deviation of Male and Female Teachers on Their Level of Readiness to Integrate E-Learning Platforms in the Teaching of Trade Skills in Technical Colleges in Abia State

S/No	Item Statements	Male Teachers N_1=40		Female Teachers N_2 = 11		Decision
		X_1	SD_1	X_2	SD_2	
1.	I am willing to adopt e-learning platforms for teaching trade skills	3.16	0.88	3.01	0.87	HE
2.	I possess the ICT competence required to use e-learning platforms effectively	3.18	0.60	3.19	0.61	HE
3.	I am confident in integrating e-learning platforms into my instructional deliver.	3.19	0.76	3.11	0.75	HE
4.	I am motivated to learn and apply e-learning in trade skill instruction	3.28	0.76	3.11	0.74	HE
5.	I am ready to attend training or workshops on e-learning integration	3.24	0.76	3.15	0.74	HE
6.	I believe e-learning platforms can improve the teaching and learning of trade skills	3.21	0.73	3.25	0.75	HE
7.	I am ready to adjust my teaching methods to accommodate e-learning strategies	3.19	0.81	3.11	0.82	HE
8.	I am open to collaborating with colleagues to promote e-learning adoption	3.13	0.74	3.05	0.75	HE

9.	I am confident that I can overcome challenges associated with e-learning integration	2.61	0.77	2.75	0.36	HE
10.	I intend to continue improving my digital skills for effective e-learning integration	3.11	0.77	3.06	0.75	HE
	Cluster Mean/Standard Deviation	**3.13**	**0.76**	**3.08**	**0.71**	**HE**

Key: X = Mean, SD = Standard Deviation, N = Number, HE = High Extent, LE = Low Extent

The result presented in Table 2 indicated the mean and standard deviation of the responses of both male and female teachers regarding their level of readiness to integrate e-learning platforms in the teaching of trade skills in technical colleges in Abia State. The mean scores for the 10 items ranged from 2.61 to 3.28, with cluster means of 3.13 and 3.08 for the male teachers and female teachers respectively, which indicated a generally high level of readiness to integrate e-learning platforms in the teaching of trade skills in technical colleges in Abia State. Furthermore, the standard deviation values ranged between .36 and .88, which showed a relatively low dispersion and a high level of agreement among respondents. Based on these findings, it can be inferred that the level of teachers' readiness to integrate e-learning platforms in the teaching of trade skills in technical colleges in Abia State is high.

Research Question 3

What is the extent of utilisation of e-learning platforms by teachers for teaching trade skills in technical colleges in Abia State?

Table 3: Mean Scores and Standard Deviation of Male and Female Teachers on Their Extent of Awareness of E-Learning Platforms Available For Teaching Trade Skills in Technical Colleges in Abia State

S/No	Item Statements	Male Teachers N_1=40		Female Teachers N_2 = 11		Decision
		X_1	SD_1	X_2	SD_2	
1.	I use e-learning platforms regularly to teach trade skills	1.65	0.70	1.76	0.71	HE
2.	I upload instructional materials such as manuals, videos, or slides to e-learning platforms	1.21	0.88	1.32	0.82	LE
3.	I use e-learning platforms to assign students' practical and theoretical tasks	1.03	0.62	1.11	0.61	HE
4.	I interact with my students through online discussions and feedback sessions	1.12	0.74	1.15	0.75	HE
5.	I use e-learning platforms to evaluate students' learning progress	1.02	0.71	1.10	0.70	LE
6.	I integrate e-learning activities into my lesson plans	1.14	0.71	1.12	0.71	HE
7.	I demonstrate trade skills using video tutorials or digital simulations on e-learning platforms	1.22	0.64	1.31	0.65	HE
8.	I use mobile-based applications to facilitate trade skills learning	1.12	0.73	1.15	0.73	LE

9.	I encourage students to complete assignments or projects through e-learning platforms	1.04	0.70	1.01	0.71	LE
10.	I participate in online professional groups or communities related to trade skill teaching	1.11	0.80	1.09	0.86	LE
	Cluster Mean/Standard Deviation	**1.17**	**0.72**	**1.21**	**0.73**	**LE**

Key: X = Mean, SD = Standard Deviation, N = Number, HE = High Extent, LE = Low Extent

The result presented in Table 3 indicated the mean and standard deviation of the responses of both male and female teachers regarding their extent of utilisation of e-learning platforms for teaching trade skills in technical colleges in Abia State. The mean scores for the 10 items ranged from 1.02 to 1.76, with cluster means of 1.17 and 1.21 for the male teachers and female teachers respectively, which indicated a generally low extent of utilisation of e-learning platforms for teaching trade skills among them. Furthermore, the standard deviation values ranged between .62 and .88, which indicated a relatively low dispersion and a high level of agreement among respondents. Based on these findings, it can be inferred that the extent of utilisation of e-learning platforms by technical teachers for teaching trade skills in technical colleges in Abia State is low.

HO_1: There is no significant difference between the mean responses of male and female technical college teachers in their extent of awareness of e-learning platforms for teaching trade skills in Abia State.

Table 4: The t-test Analysis Results of Mean Responses of Male and Female Technical College Teachers in Their Level of Awareness of E-Learning Platforms for Teaching Trade Skills in Abia State

Hypotheses	Groups	N	X	SD	Df	t	P-value	Decision
HO_1	Male Teachers	40	1.84	.73	49	.39	.70	Accept
	Female Teachers	11	1.94	.75				

Key: N= Number, X= Mean, SD= Standard Deviation, Df= Degree of freedom, CI= Confidence interval

Table 4 showed the t-test analysis of mean responses of male and female technical college teachers on their extent of awareness of e-learning platforms for teaching trade skills in Abia State. Based on the findings presented in the table, it was observed that at 49 degrees of freedom, the p-value was .70 which exceeded the predetermined significance level of 0.05 for this study. Consequently, the null hypothesis is accepted. This signifies that there is no significant difference between the mean responses of male and female technical college teachers on their extent of awareness of e-learning platforms for teaching trade skills in Abia State.

HO_2: There is no significant difference between the mean responses of male and female technical college teachers in their level of readiness to integrate e-learning platforms in the teaching of trade skills in Abia State.

Table 5: The t-test Analysis Results of Mean Responses of Male and Female Technical College Teachers on Their Level of Readiness to Integrate E-Learning Platforms in the Teaching of Trade Skills in Abia State

Hypotheses	Groups	N	X	SD	Df	t	P-value	Decision
HO_2	Male Teachers	40	3.13	.76	49	.20	.84	Accept
	Female Teachers	11	3.08	.71				

Key: N= Number, X= Mean, SD= Standard Deviation, Df= Degree of freedom, CI= Confidence interval

Table 5 shows the t-test analysis of mean responses of male and female technical college teachers in their level of readiness to integrate e-learning platforms in the teaching of trade skills in Abia State. Based on the findings presented in the table, it can be observed that at 49 degrees of freedom, the p-value is .84 which exceeds the predetermined significance level of 0.05 for this study. Consequently, the null hypothesis is accepted. This signifies that there is no significant difference between the mean responses of male and female technical college teachers in their level of readiness to integrate e-learning platforms in the teaching of trade skills in Abia State.

HO_3: There is no significant difference between the mean responses of male and female technical college teachers in their extent of utilisation of e-learning platforms for teaching trade skills in Abia State.

Table 6: The t-test Analysis Results of Mean Responses of Male and Female Technical College Teachers on Their Extent of Utilisation of E-Learning Platforms for Teaching Trade Skills in Abia State

Hypotheses	Groups	N	X	SD	Df	t	P-value	Decision
HO_3	Male Teachers	40	1.17	.72	49	.16	.87	Accept
	Female Teachers	11	1.21	.73				

Key: N= Number, X= Mean, SD= Standard Deviation, Df= Degree of freedom, CI= Confidence interval

Table 6 showed the t-test analysis of mean responses of male and female technical college teachers in their extent of utilisation of e-learning platforms for teaching trade skills in Abia State. Based on the findings presented in the table, it can be observed that at 49 degrees of freedom, the p-value is .87 which exceeds the predetermined significance level of 0.05 for this study. Consequently, the null hypothesis is accepted. This signifies that there is no significant difference between the mean scores of male and female technical college teachers in their extent of utilisation of e-learning platforms for teaching trade skills in Abia State.

Discussion of Findings

Findings of the study revealed the extent of teachers' awareness of e-learning platforms available for teaching trade skills in technical colleges in Abia State. From the findings, the teachers revealed a low extent of awareness of various e-learning platforms that can be used for teaching trade skills, such as Google Classroom, Moodle, and Edmodo. This finding implied that technical teachers had not received information or training on e-learning platforms relevant to technical education. This finding is in line with that of Eze et al. (2021) who found a low extent of awareness of modern learning platforms among secondary school teachers. Also, there was no significant difference between the mean responses of male and female

technical college teachers on their extent of awareness of e-learning platforms for teaching trade skills in Abia State.

Furthermore, the study also revealed the extent of utilisation of e-learning platforms by teachers for teaching trade skills in technical colleges in Abia State. From the findings in Table 2, it was observed that: technical college teachers in Abia State do not use e-learning platforms regularly to teach trade skills; do not upload instructional materials such as manuals, videos, or slides to e-learning platforms; do not use e-learning platforms to assign students' practical and theoretical tasks; do not interact with students through online discussions and feedback sessions, and do not use e-learning platforms to evaluate students' learning progress. This indicated a low extent of utilisation of e-learning platforms for teaching trade skills. This finding aligns with that of Okojie and Otu (2023) who found out that the teaching of trade skills in many technical colleges largely depends on conventional methods with limited use of modern instructional technologies. Also, the study found no significant difference between the mean responses of male and female technical college teachers in their extent of utilisation of e-learning platforms for teaching trade skills in Abia State.

Findings of this study also revealed the level of teachers' readiness to integrate e-learning platforms in the teaching of trade skills in technical colleges in Abia State. From their responses, technical college teachers in Abia state indicated among others that they are willing to adopt e-learning platforms for teaching trade skills; they are confident in integrating e-learning platforms into instructional delivery; they are motivated to learn and apply e-learning in trade skill instruction; and they are ready to attend training or workshops on e-learning integration. This finding corroborates with that of Afolabi et al. (2022) and Iroegbu (2023) who found out that despite the challenges of integrating e-learning among teachers such as poor internet connectivity, lack of digital devices, and insufficient ICT infrastructure, many teachers are willing to be trained in the use of these modern facilities in teaching. Additionally, the study found no significant difference between the mean responses of male and female technical college teachers in their level of readiness to integrate e-learning platforms in the teaching of trade skills in Abia State.

CONCLUSION

The findings revealed that technical college teachers exhibited a low extent of awareness and utilisation of available e-learning platforms such as Google Classroom, Moodle, and Edmodo in teaching trade skills. This limited awareness and utilisation could be attributed to inadequate training opportunities and insufficient exposure to e-learning innovations within the technical education sector. Nevertheless, the study found that teachers demonstrated a high level of readiness and willingness to adopt and integrate e-learning platforms into instructional delivery, provided they receive the necessary institutional and infrastructural support. The results further showed no significant difference between male and female teachers regarding their awareness, utilisation, and readiness to integrate e-learning platforms for teaching trade skills. This suggests that the gender of the teacher does not significantly influence the level of engagement with e-learning technologies in technical colleges. Thus, while the current level of awareness and utilisation of e-learning platforms among technical college teachers in Abia State remains low, the positive disposition and readiness of teachers to adopt digital instructional tools present a promising opportunity for the digital transformation of technical and vocational education.

RECOMMENDATIONS

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

1. The Abia State Ministry of Education, in collaboration with relevant educational agencies such as the NBTE, should organize regular workshops, seminars, and capacity-building programmes to improve teachers' awareness and competence in using e-learning platforms for teaching trade skills.
2. The Abia State Government and school administrators should ensure the adequate provision of ICT tools such as computers, projectors, internet connectivity, and reliable power supply in technical colleges to facilitate the effective integration of e-learning.
3. Educational policymakers should develop and enforce policies that promote the mandatory use of e-learning platforms as part of teaching and learning processes in technical and vocational education institutions.
4. Teachers who demonstrate excellence and innovation in integrating e-learning in trade skill instruction should be recognized and rewarded to sustain their motivation and encourage others.
5. Technical Colleges should partner with technology firms, NGOs, and educational bodies to provide digital literacy training, access to software licenses, and maintenance support for e-learning tools.
6. Regular monitoring and evaluation mechanisms should be established to assess the progress of e-learning adoption and identify areas that require improvement within the technical education system.

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Sustainable Development Goals and Community Participation as Correlates of Quality Education at the Universal Basic Education Level in Abia State, Nigeria

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Abstract

This study investigated sustainable development goals (SDGs) and community participation as correlates of quality education at the universal basic education level in Abia State. The study's objectives include determining the correlation between community participation in educational initiatives and attainment of SDG-related educational goals in primary in Universal Basic Education in Abia State and ascertaining the correlation between community engagement in educational initiatives and specific SDG-related educational outcomes in Abia State. Correlation design was employed in this study. Stratified random sampling technique was used to select 100 teaching (50) principals (50) teachers in public secondary schools in Abia state; the research instrument was titled sustainable development goals (SDGs) and community participation questionnaire containing 21-item statements. The items were designed on a 4-point rating scale of strongly Agree (SA), Agree (A), Disagree (D), and strongly Disagree (SD) with weights as 4, 3, 2 and 1 respectively. The face validity of the instrument (Questionnaire) was determined by three research experts in Educational Management, and Measurement and Evaluation in MOUAU. The concluded from the results that there was significant correlation between community participation in educational initiatives and attainment of SDG-related educational goals in Universal Basic Education in Abia State. It was also found that there was significant correlation between community engagement in educational initiatives and specific SDG-related educational outcomes. Based on the conclusion, the study recommends improving communication and collaboration between educational institutions and local communities, using community-based organizations, traditional leaders, and other stakeholders as intermediaries.

Keywords: Sustainable development goals, Community participation, Universal basic education, quality education.

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INTRODUCTION

Community participation refers to the involvement and engagement of local communities in the planning, implementation, and monitoring of development initiatives, such as educational programs, health services, and infrastructure projects. It is the process through which local community members actively engage in and influence the design, implementation, and evaluation of programs, projects, and policies that affect their lives (Silva, 2018). According to Choudhury (2016), it refers to the extent to which community members are able to influence decision-making processes and actively engage in shaping the direction and outcomes of development initiatives. Community participation involves the involvement of local communities in identifying and defining their needs and priorities, taking collective action to address those needs, and sharing responsibility for decision-making and implementation of development initiatives (Patel, 2015).

It involves empowering communities to take ownership of these initiatives, making their voices heard, and ensuring that the programs and policies are tailored to their needs and priorities. Community participation can take many forms, including consultation,

collaboration, empowerment, and partnership. When communities are engaged in development initiatives, they are more likely to support and sustain those initiatives, leading to improved outcomes and long-term benefits for individuals and communities.

Community participation play a pivotal role in fostering sustainable growth and well-being among the citizens in any society. It aim to promote participatory democracy, improved standard of living, equal right and social justice among citizens in any nation (Dano, 2023). According to Kenny and Connors (2017), it work towards addressing the needs of community members, uplifting their living standards, and promoting social justice, inclusion, and human rights. Community development projects is essential for the sustainable development, empowerment, inclusivity, and social justice of any society (FGI, 2022). According to this organization these projects aim to address the needs of community members and uplift them, ultimately by improving their living standards.

Community engagement is a broad umbrella term that refers to the process of working collaboratively with individuals, groups, and organizations to address issues that impact the well-being of a community or society at large. It encompasses a range of activities, such as consultation, dialogue, participation, partnership, and collaboration (Ferman-Garmon, 2022). Community engagement is a broad concept that encompasses various forms of interaction between organizations, agencies, and communities (Gaventa, 2016). It is a process by which individuals and organizations work together to identify and address issues of mutual concern, working towards the wellbeing of all (Neal, 2020). According to Biersteker, (2019) community engagement is crucial for achieving sustainable development, as it promotes social inclusion, increases ownership and accountability, and fosters innovation and resilience.

Engagement can be achieved through a range of activities, including: consulting with local stakeholders, involving community members in decision-making processes, providing training and education, and building collaborative partnerships. Effective community engagement requires a deep understanding of the needs, priorities, and cultural contexts of the communities involved. [Tang, 2020]. Moreover, community engagement has a range of benefits for both communities and organizations: first and foremost, it increased social capital and community cohesion among community members, improved decision-making and governance, and increased knowledge and skills. It can also help organizations to better understanding of local contexts and priorities; increased legitimacy and trust; and in greater efficiency and effectiveness of programs and initiatives. In sum, community engagement is a powerful tool for promoting development, enhancing social inclusion, and building a more just and sustainable world.

The National Association of Community Development Extension Practitioners (NACDEP) (2023), defines Community Development as a practice-based profession and an academic discipline that promotes sustainable development, human rights, equality, economic opportunity, and social justice through, educating, and empowering the people within their communities.

In 2015, all the countries in the United Nations adopted the 2030 Agenda for Sustainable Development. It sets out 17 Goals, which include 169 targets. These wide-ranging and ambitious Goals interconnect. Goal 3 is to ensure healthy lives and promote well-being for all at all ages The SDGs are an unprecedented global effort to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity. The SDGs build on the success of the Millennium Development Goals (MDGs), but go much further to address the root causes of poverty and global challenges such as climate change, inequality, and the unsustainable use of natural resources (United Nations, 2015). These 17 interlinked global goals are designed to be

a blueprint to achieve a better and more sustainable future for all'. The goals cover a range of social, economic, and environmental issues, such as poverty, hunger, health, education, gender equality, clean water and sanitation, affordable and clean energy, decent work and economic growth, reduced inequalities, sustainable cities and communities, and climate action (World Economic Forum, 2018).

The Sustainable Development Goals (SDGs) provide a framework for addressing some of the most pressing global challenges, including poverty, inequality, and climate change. Education, as outlined in SDG 4, is a critical component in achieving these goals, providing individuals with the knowledge, skills, and values necessary to contribute to economic growth and social progress.

Sustainable Development Goals (SDG 4) also emphasizes the importance of teacher training, quality teaching materials, and equitable access to technology in order to provide all students with the resources they need to succeed (UNESCO, 2024). Additionally, the goal aims to promote a culture of learning and knowledge sharing that encourages students to develop critical thinking skills and engage in civic participation. SDG 4 is important because it recognizes that education is a fundamental human right and a key driver of sustainable development. Without quality education, individuals and communities are unable to fully participate in economic, social, and political life.

Some of the specific targets of SDG 4 include: Ensuring that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes; and ensures that all girls and boys have access to quality early childhood development, care and preprimary education (UNESCO, 2024). However, ensuring the attainment of SDG-related educational goals requires more than just investments in schools and educational infrastructure; it also necessitates the active involvement and support of communities.

Irrespective of the importance of community participation in promoting educational development, little is known about the specific role that community engagement plays in achieving SDG-related educational goals in Abia State, Nigeria. Previous studies such as Ibe (2023), have highlighted the benefits of community involvement in education, including increased access to resources, improved parental engagement, and enhanced student learning outcomes. However, there is a dearth of research on the correlation between community participation and SDG-related educational goals in this particular context. This study aims to address this gap by exploring the relationship between community engagement and SDG-related educational goals in primary and secondary schools in Abia State. This research aims to address the understudied relationship between community engagement and SDG-related educational goals in Abia State, Nigeria, with the ultimate goal of contributing to the advancement of education and sustainable development in the region.

Statement of the Problem

In spite of the crucial role that education plays in promoting sustainable development, achieving the Sustainable Development Goals (SDGs) in the education sector has been hindered by various factors, including limited community engagement in educational initiatives. In Abia State, Nigeria, this problem is particularly acute, where the attainment of SDG-related educational goals, such as increased literacy rates, higher school enrollment, and improved student outcomes, remains a challenge due to a lack of effective community participation.

This lack of community engagement results in a disconnect between educational policies and practices and the needs and priorities of local communities, limiting the effectiveness of educational initiatives and hindering progress toward achieving SDG-related educational goals. The issue is further exacerbated by cultural barriers, language barriers, and limited awareness and understanding of the SDGs among communities. Therefore, addressing this gap in community participation is essential for improving educational outcomes and advancing the SDGs in Abia State, Nigeria.

Purpose of the Study

This study investigated sustainable development goals (SDGs) and community participation as correlate of quality education at the universal basic education level in Abia State. Specifically, the study's objectives were to:

1. find out the correlation between community participation in educational initiatives and attainment of SDG-related educational goals in primary in Universal Basic Education in Abia State
2. ascertain the correlation between community engagement in educational initiatives and specific SDG-related educational outcomes in Abia State.

Research Questions

1. What is the correlation between community participation in educational initiatives and attainment of SDG-related educational goals in primary in Universal Basic Education in Abia State?
2. What is the correlation between community engagement in educational initiatives and attainment of SDG-related educational outcomes in Abia State?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance.

$H0_1$: There is no significant correlation between community participation in educational initiatives and attainment of SDG-related educational goals in Universal Basic Education in Abia State.

$H0_2$: There is no significant correlation between community engagement in educational initiatives and specific SDG-related educational outcomes in Abia State

METHODOLOGY

Correlation design was employed in this study. Correlation design is a research design widely used to measure relationships between two or more variables (Ali, 2006). The area of the study was Abia State. Stratified random sampling technique was used to select 369 teaching (200) and non-teaching (169) staff of two higher institutions in Abia state. The respondents were selected on the basis of availability in the process of administering the questionnaire instrument. Two structured research instruments were developed by the researchers for data collection, namely: "Sustainable Development Goals Questionnaire (SDGQ)" and"Community Participation Questionnaire (CPQ)". The SDGQ contained 20 items organized into four clusters of five items each in line with the specific purposes of the study while the CPQ contained 15 items on community participation in basic education, grouped into four clusters of three items each derived from the study purposes: The items were designed on a 4-point rating scale of strongly Agree (SA), Agree (A), Disagree (D), and strongly Disagree (SD) with weights as 4, 3, 2 and 1 respectively. The face validity of the instrument

(Questionnaire) were determined by 3 research experts in Educational Management, Adult and Continuing Education, and Measurement and Evaluation in MOUAU. The experts were given the initial draft of the instrument and they viewed the items in terms of content (coverage) ideas, language, suitability and coherence, etc. Their corrections and suggestions were used to modify the items of the questionnaire used in the study.

The reliability of the questionnaire was obtained through test re-test method. After computation using Pearson product Moment Correlation (Pr) procedure, reliability values of 0.87 and 0.78 were obtained respectively. One hundred copies of the questionnaire were administered to the respondents with the help of two briefed research assistants. The respondents were those that were available at the time of visit by the researchers to the 6 UBE (3-Urban and 3 –Rural) schools in Abia state. Collection was done using on the spot method. This ensured 100% collection of the instrument. Pearson Product Moment Correlation (Pearson r) was used to test the hypotheses 1 and 2 while independent samples t-test was used to test hypothesis at 0.05 level of significance. The criterion for accepting and rejecting Hypotheses 1 and 2 was reject H0 if r- cal. is less than r: table and accept H_0 if r-cal. is greater than r-table at 0.05 level of significance. For hypothesis 3, the criterion was reject H_0 if t-cal. is less than t-crit and accept H0 if t-cal. is greater than t-crit.

RESULTS

Research Question One

What is the correlation between community participation in educational initiatives and attainment of SDG-related educational goals in primary in Universal Basic Education in Abia State?

Table 1: Correlation matrix of relationship between community participation educational initiatives and attainment of SDG-related educational goals in Universal Basic Education

		CPM	EBE
CPM	Pearson Correlation	1	.613**
	Sig. (2-tailed)		.000
	N	369	369
EBE	Pearson Correlation	.613**	1
	Sig. (2-tailed)	.000	
	N	369	369
	R^2	.375 (37.5%)	

***. Correlation is significant at the 0.01 level (2-tailed).*
CPM = Community Participatory Management
EBE = Effective Basic Education

Data in Table 1 indicate a correlation coefficient (r) of .613 between community participatory management (CPM) and effective basic education (EBE). This value falls within the ±.40–.69 coefficient limit and is therefore interpreted as a strong/high positive relationship. This means that, to a high extent, improvements in community participatory management are associated with improvements in effective basic education in South East Nigeria. The coefficient of determination (R^2) of 0.375 shows that 37.5% of the variance observed in effective basic education was accounted for by community participatory management.

Hypothesis 1: There is no significant correlation between community participation in educational initiatives and attainment of SDG-related educational goals in Universal Basic Education in Abia State (P<0.05).

Table 2: Pearson Product Moment Correlation (Pr) between community participation in educational initiatives and attainment of SDG-related educational goals

Variables	N	X	SD	DF	r'-cal	r'-table
Community Participation in Educational initiatives	100	11.56	0.39	88	0.250	0.456
Attainment of SDG-related educational goals	100	21.65	0.36			

The results on Table 2 show that the r'-cal. of 0.250 is less than r' table of 0.456 at 0.05 level of significance. Therefore, the hypothesis I is rejected meaning that there is significant correlation between community participation in educational initiatives and attainment of SDG-related educational goals in Universal Basic Education in Abia State

Research Question two

What is the correlation between community engagement in educational initiatives and attainment of SDG-related educational outcomes in Abia State?

Table 3: Correlation matrix of relationship between community engagement in educational initiatives and attainment of SDG-related educational outcome

		CIM	EBE
CIM	Pearson Correlation	1	.529**
	Sig. (2-tailed)		.000
	N	369	369
EBE	Pearson Correlation	.529**	1
	Sig. (2-tailed)	.000	
	N	369	369
	R^2	.280 (28.0%)	

***. Correlation is significant at the 0.01 level (2-tailed). CIM = Community Infrastructure Maintenance. EBE = Effective Basic Education*

Data in Table 3 indicate a correlation coefficient (r) of .529 between community engagement in educational initiatives and attainment of SDG-related educational outcome.This value falls within the ±.50–.69 coefficient limit and is therefore interpreted as a strong/high positive relationship. This means that, to a high extent, improvements in community engagement in educational imitative are associated with attainment of SDG-related educational outcome in South East Nigeria. The coefficient of determination (R^2) of 0.280 shows that 28.0% of the variance observed in effective attainment of SDG-related educational outcome.

Hypothesis 2: There is no significant correlation between the community engagement in educational initiatives and specific SDG-related educational outcomes in Abia State (P<0.05).

Table 4: Pearson Product Moment Correlation between community engagement in educational initiatives and specific SDG-related educational outcomes

Variables	N	X	SD	DF	r'-cal	r'-table
Community Engagement in Educational initiatives	100	14.22	0.280	88	17.35	27.48
Attainment of SDG-related educational goals	100	7.11	0.265			

Data on table 4 show that r' cal. value of 17.35 is less than the r' table of 27.48 at 0.05 level of significance. This indicates that the hypothesis of no significant correlation between community engagement in educational initiatives and specific SDG-related educational outcomes is rejected. Therefore, there is significant correlation between community engagement in educational initiatives and specific SDG-related educational outcomes in Abia State

Discussion of Findings

The result revealed that there was significant correlation between community participation in educational initiatives and attainment of SDG-related educational goals in Universal Basic Education in Abia State. This finding supports the report of Ogbulu and Akpabio (2019) which found that community participation in education as a critical factor in achieving SDG-related goals in primary education in Nigeria, particularly in low-income communities. They noted that effective community participation requires a holistic approach that considers cultural and socio-economic factors. Also, it equally gives credence to the assertion by Enang & Ezeokoli (2023) who emphasized the need for a participatory approach to education planning and implementation in Abia State. They argued that this approach would help to align educational goals with local needs and priorities, leading to more sustainable and equitable outcomes.

It also revealed that there was significant correlation between community engagement in educational initiatives and specific SDG-related educational outcomes in Abia State. This finding collaborates the findings of Uchendu and Nnamani's (2022) which found significant correlations between community engagement and SDG-related educational outcomes in Abia State, such as increased literacy rates and reduced gender disparities. These findings go a long way to authenticate the assumptions of the Nwachukwu & Egbunike (2023) study which further supports the correlations between community engagement and SDG-related educational outcomes, particularly in primary and secondary schools in Abia State.

CONCLUSION

From all indications, the study revealed that the vital role of community participation in promoting SDG-related educational goals in primary and secondary schools in Abia State. Hence the findings of this study was that community participation in educational initiatives correlates significantly with specific SDG-related educational outcomes in Abia state. Therefore, serious efforts should be made not only to involve members of community in community development but to strategies and increase community participation by engaging them in all initiatives programmes, such as community-based education programs, parent-teacher associations, and community-driven school improvement plans.

RECOMMENDATIONS

1. There is need to Improve communication and collaboration between educational institutions and local communities, using community-based organizations, traditional leaders, and other stakeholders as intermediaries.
2. Foster a greater awareness and understanding of the SDGs among communities, using educational campaigns, workshops, and other outreach activities to promote awareness and engagement.
3. Foster a greater awareness and understanding of the SDGs among communities, using educational campaigns, workshops, and other outreach activities to promote awareness and engagement.

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Leveraging Digital Technologies to Transform Industrial Technology Education in South-East Nigerian Universities for Youth Employment

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Abstract

This study focused on leveraging digital technologies to transform Industrial Technology Education in South East Nigerian Universities for youth employment. The population of this study consists of 86 lecturers in the Department of Industrial Technology Education in Universities in South East Nigeria, Proportional Stratified random sampling technique was used to select the respondents. A sample size of 43 lecturers was selected, consisting of 25 males and 18 females. A 22-item questionnaire titled: Leveraging Digital Technologies to Transform Industrial Technology Education in South-East Universities in Nigeria for Youth Employment (LDTTITESUNYE) structured in a four point rating scale was used for data collection, The instrument for the study was face-validated by three experts: two from the Department of Industrial Technology Education and one lecturer from Science Education (Measurement and Evaluation) Michael Okpara University of Agriculture, Umudike, Abia State. The reliability of the instrument was estimated through trial-testing by administering the questionnaire to five male and three female ITE lecturers in the University of Uyo, Akwa Ibom State. Cronbach Alpha Coefficient was used to determine the internal consistency of each set of items which yielded a reliability coefficient of .87. The data collected was analyzed using mean, standard and t-test. The result revealed that the respondents agreed with all items with mean scores ranging from 2.74 - 3.81. This shows that the mean value of each items was above the cut-off point of 2.50 and t-test was used to test the hypotheses at .05 level of significance, Findings revealed that by integrating digital tools, simulations and online platforms, Universities can provide students with practical skills, industry-relevant knowledge, and increase competitiveness in the job market. Based on the findings of this study. It was recommended among others that the National Universities Commission (NUC) should review and update Industrial Technology Education Curricula to include digital competencies such as CAD, simulation and automation. Universities should be equipped with modern digital tools, software and laboratories to enhance practical learning experience.

Keywords: Digital Technologies, Industrial Technology Education, Youth Employment, Universities.

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INTRODUCTION

Education has long been recognised as a critical driver of socio-economic and technological transformation in every nation. In particular, Industrial Technology Education has emerged as one of the most practical and responsive forms of technical and vocational education, aimed at equipping learners with technical skills, problem-solving capacity, and entrepreneurial abilities necessary for employment and national development. This makes it important to examine how the program is structured and delivered at the tertiary level, where it is expected to shape competent graduates for the world of work.

At the tertiary level, Industrial Technology Education combines theoretical foundations in science and technology with practical experiences in workshops, laboratories, and industries to prepare graduates for productive roles in both the formal and informal sectors (Musa, Chosi, & Ogbuanya, 2024). These roles contribute directly to national growth and development, especially in economies that rely heavily on technical expertise. In line with this contribution, Arimonu and Aigboduna (2020) posited that Industrial Technology Education plays a vital dual role in national development: first, by providing a skilled workforce capable of managing and sustaining industries; and second, by fostering self-reliance among graduates who can establish their own enterprises. This dual role makes Industrial Technology Education particularly important in developing countries like Nigeria, where graduate unemployment remains a pressing socio-economic challenge. Understanding these challenges highlights the need to explore how digital technologies can be leveraged to enhance the relevance and effectiveness of Industrial Technology Education.

Globally, the role of Industrial Technology Education have been redefined by the rapid diffusion of digital technologies under Industry 4.0, which has transformed both industrial and educational processes (Schwab, 2017). For instance, in Germany, the dual education system links industries with vocational education institutions through digital simulations and smart factories. In South Korea and Singapore, universities have adopted blended learning and smart classrooms to train Industrial Technology Education students in digitally enabled environments (Majumdar, 2017). The United States equally emphasizes e-learning platforms, cloud-based labs, and entrepreneurship incubators to bridge the gap between learning and industry application. These global practices highlight the necessity of aligning Industrial Technology Education curricula with digital innovation to ensure relevance in the 21st Century.

The concept of digital technologies refers to computer-based tools, platforms, and innovation such as e-learning systems, virtual laboratories, artificial intelligence, and online collaboration platforms that enhance teaching and learning outcomes. Digital technologies have significantly transformed teaching and learning processes in Nigerian universities. The integration of multimedia resources, virtual laboratories, and interactive software has made learning more engaging and effective. Virtual reality (VR) and augmented reality (AR) technologies, though still emerging, offer immersive learning experiences, particularly in Industrial Technology Education. These technologies enable students to visualise complex concepts and practice skills in a controlled environment, thereby enhancing their understanding and proficiency.

Digital technologies offer numerous benefits that can significantly enhance research and innovation in Nigerian universities. The integration of these digital tools has shown significant potential in creating dynamic, personalized learning environments, enhancing student engagement, and fostering inclusive education (Joseph, Onwuzulike, & Shitu, 2024). The globalization of education has already necessitated the application of digital technologies. Online platforms were available for conducting classes, sharing resources, doing the assessment and managing the day to day activities of academic institutions. However, the use of these platforms was proactive. The COVID-19 Pandemic has forced the institutes to adopt the online teaching mode to sustain the education system. Developed countries were well equipped to deal with this crisis. However, developing countries worked hard to meet this requirement.

This global crisis highlights the need to be internationally integrated into the education system. Digital technologies assist in developing abilities that will require students' professional performance, such as problem-solving, thinking structure creation, and process comprehension. They are also preparing for a more unpredictable and changing future in which

technology will play a critical role. Students' acquired qualities and abilities will be essential to their professional success. Educational resources and digital tools help to improve the classroom atmosphere and make the teaching-learning process more compelling. Furthermore, they give each educational institution greater flexibility and customization of curriculum based on the requirements of each student.

Children might become more engaged in learning if technology is used in the classroom (Cabalbag, 2025). These days youngsters are pretty accustomed to the usage of electronic gadgets, incorporating them into schooling would undoubtedly assist in piquing their interest and enhancing their involvement levels (Clemente-Suárez et al., 2024). Integrating technology into education provides students with engaging learning experiences, allowing them to remain more interested in the subject without being distracted. The utilization of projectors, computers, and other cutting-edge technical gadgets in the classroom may make studying fascinating and entertaining for students.

Using computers and other devices in conjunction with digital tools allow students to play more proactive roles and be at the centre of the process. The instructor becomes a guide in this process and can approve learning efficiency. Using the myriad of digital resources, learners may download the required information or upload their content. The web 2.0 technologies (wikis, podcasts, blogs among others) facilitate learners to generate content, collaborate with others, assess each other work and move toward co-learning. Technologies make it easy to use classroom tactics like gamification or approaches like flipped classrooms that optimize learning. Learning landscapes have evolved as a didactic tool that mix several techniques and enable distinct itineraries to be presented to each student as technologies makes the instruction more inspiring and meaningful. However, effectiveness of these technologies depends largely on their strategic and purposeful integration into teaching practices rather than mere availability (Redecker, 2017).

The idea of leveraging technologies emphasizes purposeful adoption and optimal use of these innovations to improve teaching methods, update workshop practices, and prepare graduates for the challenges of a knowledge-driven economy. Within the South-East Nigerian University context, this process of transformation is essential to align educational outcomes with 21st Century expectations. In Africa, however, the integration of digital technologies in education has been slow and uneven. The African Union (2015). Agenda 2063 underscores the importance of digital transformation for economic growth. But the continent faces barriers such as poor digital infrastructure, inadequate funding, and a shortage of ICT-competent educators. Nigeria, despite being Africa's most populous country and one of its largest economies, struggles with similar challenges. The Federal Republic of Nigeria (2013) recognizes technical and vocational education as vital for youth employment, undoubtedly implementation has been hampered due to inadequate funding, inadequate monitoring, and limited adoption of emerging technologies (Eze & Okoroafor, 2019).

This issue is further compounded by Nigeria's alarming rate of youth unemployment. According to the National Bureau of Statistics (2024), the youth unemployment rate stood at 8.4% between January and March, a slight improvement from 8.6% recorded between July and September 2023 but further declined to 6.5% between April and June 2024. A significant proportion of these unemployed youths are university graduates who lack the requisite digital and entrepreneurial skills demanded by employers. Industrial Technology Education, if well restructured, has the potential to serve as a catalyst for reversing this trend by producing employable, digitally literate, and self-reliant graduates. At the same time, industries in the region demand graduates who are digitally competent and entrepreneurial. This mismatch

between educational output and industry expectations underscores a significant gap in the current Industrial Technology Education system.

Addressing this gap requires more than policy statements; it calls for actionable strategies that embed digital tools into curriculum design, pedagogy, and industry partnership. Without this shift, South-Eastern Nigerian Universities risk producing graduates ill-prepared for both employment and entrepreneurship in a global digital economy. This study, therefore, sought to investigate how digital technologies can be leveraged to transform Industrial Technology Education in South-East Nigerian Universities for the purposes of improving youth employment.

Statement of the Problem

Industrial Technology Education (ITE) is expected to provide the necessary skills for agricultural, industrial, commercial, and economic development of the country, in addition to producing competent graduates and skilled personnel who are enterprising and self-reliant (Federal Republic of Nigeria [FRN], 2013). This implies that the programme is strategically directed towards addressing unemployment by producing a skilled workforce capable of contributing productively to industries, while also fostering entrepreneurship and self-employment opportunities.

Many ITE programmes in South-East Nigerian universities operate with inadequate facilities. Workshops, laboratories, and studios are poorly equipped, and there is a general lack of integration of digital technologies into teaching and learning which will limit exposure of students to modern technology, resulting to students poor practical skills acquisition, low achievement and retention, and resort lecturers to chalk-and-talk ignoring practical session. If these issues are not effectively addressed, Industrial Technology Education in South-East Nigerian Universities will continue to produce graduates who are ill-equipped for the digital and industrial workforce.

Purpose of the Study

The main purpose of this study was to investigate how digital technologies can be leveraged to transform Industrial Technology Education in South-East Nigerian Universities for youth employment. Specifically, the study sought to:

1. determine strategies for effective digital transformation in Industrial Technology Education in South-East Nigerian Universities,
2. ascertain the potential impact of leveraging digital technologies on youth employability.

Research Questions

This study was guided by the following research questions:

1. What strategies can be used for effective digital transformation in Industrial Technology Education in South-East Nigerian Universities?
2. What are the potential impacts of leveraging digital technologies on youth employability and entrepreneurship?

Hypotheses

$H0_1$: There is no significant difference between the mean responses of female and male lecturers on strategies for effective digital transformation in Industrial Technology Education in South-East Nigerian Universities.

$H0_2$: There is no significant difference between the mean responses of female and male lecturers on the potential impacts of leveraging digital technologies on youth employability and entrepreneurship

METHODOLOGY

The study adopted a descriptive survey research design. According to Creswell & Creswell (2023). Descriptive survey design is a systematic approach to describe a population's attitudes, opinions, or trends through numerical data. The area of the study was the South-East geopolitical zone of Nigeria. The study was carried out in all the universities offering Industrial Technology Education (ITE) and related technical programs such as: University of Nigeria, Nsukka (UNN), Nnamdi Azikiwe University, Awka (UNIZIK), Michael Okpara University of Agriculture, Umudike (MOUAU), Alex Ekwueme Federal University, Ndufu-Alike Ikwo (AE-FUNAI), Ebonyi State University (EBSU), Enugu State University of Science and Technology (ESUT). The population for this study consisted of 86 lecturers involved in the teaching of Industrial Technology Education in universities in South-East Nigeria. Proportional Stratified random sampling technique was used to select the respondents. A total sample of 43 lecturers was selected, consisting of 25 males and 18 females to maintain the original population ratio. A 22-item structured questionnaire titled Leveraging Digital Technologies to Transform Industrial Technology Education in South-East Universities in Nigeria for Youth Employment was used for data collection. The instrument for the study was face-validated by three experts: two from the Department of Industrial Technology Education and one lecturer from Science Education (Measurement and Evaluation) in Michael Okpara University of Agriculture, Umudike, Abia State. Moreover, the questionnaire was designed on a four-point modified rating scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The reliability of the instrument was estimated through trial-testing by administering the questionnaire to 20 ITE lecturers in the University of Uyo Akwa-ibom State. The responses were analysed using Cronbach Alpha reliability coefficient to determine the internal consistency of each set of items. The analysis yielded a reliability coefficient of 0.87 which was above the accepted threshold of 0.70, indicating that each of the questionnaires had high internal consistency and was therefore reliable for data collection. Mean and standard deviation were used to answer the research questions while t-test was used to test the null hypotheses.

RESULTS

Research Question 1

What strategies can be used for effective digital transformation in Industrial Technology Education in South-East Nigerian Universities?

Table 1: Mean responses of the respondents on strategies for effective digital transformation in Industrial Technology Education in South East Nigerian Universities

S/N	ITEMS	X1	X2	S	Xt	Remarks
1	Increase government funding for ICT	3.47	3.61		3.54	Agree
2	Provide stable power supply to institutions	3.01	2.85		2.93	Agree
3	Improve internet facilities across campuses	3.57	3.62		3.60	Agree
4	Organize regular training for staff	3.21	3.69		3.45	Agree
5	Encourage Public-Private Partnership	3.11	3.02		3.07	Agree
6	Integrate more e-learning platforms in teaching	2.62	2.51		2.57	Agree
7	Establish University-Industry collaborations	2.85	2.71		2.79	Agree
8	Provide free/subsidized ICT tools for students	3.43	3.26		3.35	Agree

9	Employ more ICT qualified staff	2.64	2.87	3.98	Agree
10	Ensure constant maintenance of digital facilities	3.69	3.73	3.71	Agree
11	Encourage digital entrepreneurship training	2.54	2.68	2.61	Agree

Keys: X1 = Mean of Female lecturers; X2 = Mean of Male lecturers; Xt = Average mean.

The result presented in Table 1 revealed that the respondents agreed with all the items with mean score ranges from 2.74 to 3.81. This shows that the mean value of each item was above the cut-off point of 2.50. Therefore, it can be inferred that the above items are strategies that can be used for effective digital transformation in Industrial Technology Education in South-East Nigerian Universities.

Research Question 2

What are the potential impacts of leveraging digital technologies on youth employability and entrepreneurship?

Table 2: Mean responses of the respondents on the potential impacts of leveraging digital technologies in Youth Employment and Entrepreneurship

S/N	ITEMS	X1	X2	Xt	Remarks
12	Enhances graduate employability	2.62	2.71	2.67	Agree
13	Improves entrepreneurial skills of students	2.94	2.81	2.88	Agree
14	Encourages innovation and creativity	2.92	2.78	2.85	Agree
15	Build students' digital literacy and competence	3.24	3.11	3.18	Agree
16	Help students develop problem-solving skills	2.75	2.82	2.79	Agree
17	Enables students to start technology-based businesses	3.41	3.28	3.35	Agree
18	Provide exposure to real-world digital tools	3.48	3.57	3.38	Agree
19	Promotes self-reliance after graduation	2.57	2.61	2.59	Agree
20	Increases competitiveness of student in the labour market	2.89	2.76	2.83	Agree
21	Enhances collaboration and teamwork through digital tools	3.62	3.57	3.60	Agree
22	Encourages lifelong learning through online platforms	3.21	3.04	3.13	Agree

The result presented in Table 2 revealed that the respondents agreed to all the items with mean score range from 2.59 to 3.60. All the items had their mean values above the cut-off point of 2.50 indicating agreed responses. Therefore, it can be inferred that the above items are potential impacts of leveraging digital technologies on youth employability and entrepreneurship.

Hypotheses

$H0_1$: There is no significant difference between the mean responses of female and male lecturers on strategies for effective digital transformation in Industrial Technology Education in South-East Nigerian Universities.

Table 3: Standard Deviation and t-cal analysis of the Responses of the Respondents on the strategies for Effective Digital Transformation of Industrial Technology in South East Nigeria Universities

S/N	ITEMS	X1	X2	SD1	SD2	t-Cal	Remarks
1	Increase government funding for ICT	3.47	3.61	0.50	0.45	-0.69	NS
2	Provide stable power supply to institutions	3.01	2.85	0.31	0.37	-1.00	NS
3	Improve internet facilities across campuses	3.57	3.62	0.31	0.40	-1.08	NS
4	Organize regular ICT training for staff	3.21	3.69	0.31	0.31	1.00	NS
5	Encourage public private partnerships	3.11	3.02	0.47	0.37	-0.54	NS
6	Integrate more e-learning platforms in teaching such as CAD and simulation software	2.62	2.51	0.47	0.43	0.99	NS
7	Establish university industry collaborations	2.85	2.71	0.50	0.49	-0.69	NS
8	Provide free or subsidized ICT tools for students	3.43	3.26	0.50	0.50	-0.31	NS
9	Employ more ICT-qualified staff	2.64	2.87	0.42	0.40	0.99	NS
10	Ensure constant maintenance of digital facilities	3.69	3.73	0.50	0.49	0.38	NS
11	Encourage digital entrepreneurship training	2.54	2.68	0.31	0.31	-1.22	NS

Keys: NS = Not significant, S = Significant, SD1 = Standard deviation of female lecturers, SD2 = Standard deviation of male lecturers, t-cal = test calculated, t-Critical = ± 2.02

The result presented in Table 3 revealed that the Calculated t-test of all the items were less than the Critical (± 2.02) at 0.05 level of significance. Therefore, HO1 which says there is no significant difference between the mean responses of female and male lecturers on the strategies for effective digital transformation of Industrial Technology Education in South East Nigerian Universities is accepted at 0.05 level of significance.

HO_2: There is no significant difference between the mean responses of female and male lecturers on the potential impacts of leveraging technologies on youth employment**.**

Table 4: Standard deviation and t-cal Analysis of the Responses of the Respondent on the potential impacts of leveraging Digital Technologies on Youth Employability and Entrepreneurship

S/N	ITEMS	X1	X2	SD1	SD2	t-Cal	Remarks
12	Enhances graduate employability	2.62	2.71	0.53	0.53	0.67	NS
13	Improves entrepreneurial skills of students	2.94	2.81	0.42	0.49	0.64	NS
14	Encourages Innovation and Creativity	2.92	2.78	0.37	0.42	0.47	NS
15	Build students' digital literacy and competence	3.24	3.11	0.50	0.47	0.84	NS
16	Helps students develop problem solving skills	2.75	2.82	0.49	0.50	0.40	NS
17	Enables student to start technology based businesses	3.41	3.28	0.44	0.45	0.76	NS
18	Provides exposure to real-world digital tools such as industrial automation	3.48	3.57	0.40	0.46	0.63	NS
19	Promote self-reliance after graduation	2.57	2.61	0.67	0.49	0.12	NS
20	Increases competitiveness of students in the labour market	2.89	2.76	0.39	0.48	0.35	NS
21	Enhances collaboration and teamwork through digital tools	3.62	3.57	0.32	0.51	0.17	NS
22	Encourages lifelong learning through online platforms	3.21	3.04	0.39	0.51	0.42	NS

The result presented in Table 4 revealed that the calculated t-test of all the items were less than the Critical value (± 2.02) at 0.05 level of significance. Therefore, HO2 which says there is no significant relationships between the mean responses of female and male lecturers on potential impacts of leveraging digital technologies on youth employment is accepted at 0.05 level of significance.

Discussion of Findings

The findings reveals consensus on strategic priorities, stronger support for mandatory ICT integration policies, improved internet infrastructure and increased government funding. These strategies align with Ugwuanyi's (2024) recommendations for improving Industrial Technology Education's programmes to boost job creation in South-East Nigeria, emphasizing policy frameworks, funding and practical implementation measures. The reliance on both structural and policy approaches suggest that enhancing e-learning and entrepreneurship training will be most effective if paired with systematic support. And the findings also reveal that there is no significant difference between the mean responses of female and male lecturers on strategies for effective digital transformation in Industrial Technology Education in South-East Nigerian Universities.

The second findings of the study revealed that there is no significant difference between the mean responses of female and male lecturers on the potential impacts of leveraging digital technologies on youth employability and entrepreneurship. It also unveil strong belief in the benefit of digital technologies for enhancing employability, entrepreneurship skills, innovation, digital literacy, collaboration and self-reliance through technology-based business. This finding aligns with that of Ameh (2025) who revealed that the impacts of digital literacy are numerous and would benefit the nation immensely

CONCLUSION

This study investigated the role of digital technologies in transforming Industrial Technology Education for youth employment in South-East Nigerian Universities. The findings indicated that integrating digital tools into the curriculum will improves students' technical competencies, practical skills and readiness for the labour market. Female and male lecturers agreed on the relevance of technologies such as CAD, simulation software, e-learning platforms and industrial automation for effective teaching and learning.

RECOMMENDATIONS

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

1. The National Universities Commission (NUC) should review and update Industrial Technology Curricula to include digital competencies such as CAD, simulation and automation.
2. Universities should be equipped with modern digital tools, software and laboratories to enhance practical learning experience.
3. Partnerships should be established between universities and industries for internships, industrial training and mentorship programs.
4. Lecturers should be periodically trained in emerging digital technologies and teaching methods.
5. Entrepreneurship education should be emphasized to encourage students to establish technology-driven businesses.

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Bridging the Generational Divide in Adult Education: The Role of Libraries in Digital Literacy in Nigeria

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Abstract

Adult education in Nigeria brings together learners from different generational cohorts—Baby Boomers, Generation X, Millennials, and Generation Z—each with distinct learning preferences, technological competencies, and educational expectations. This diversity presents both opportunities for knowledge sharing and challenges in achieving inclusive and effective learning. Libraries play a critical role in addressing these challenges by promoting digital literacy, facilitating access to information resources, and supporting lifelong learning across all age groups. This study examined how library-based digital literacy initiatives, adaptive instructional strategies, mentorship programmes, and reverse learning techniques can bridge the generational divide in adult education in Nigeria. A descriptive survey design was adopted, involving 150 respondents comprising adult learners, educators, and administrators drawn from selected educational institutions and community libraries. Findings revealed that library-driven digital literacy programmes significantly enhance access to educational resources and improve intergenerational knowledge sharing. Mentorship and reverse learning approaches were also found effective in promoting collaboration among different age groups. However, challenges such as inadequate funding, limited infrastructure, and insufficient staff training were identified as major constraints. The study concludes that libraries remain central to promoting inclusive digital literacy and recommends stronger investment in library services, staff development, and structured intergenerational learning programmes.

Keywords: Library, Digital Literacy, Intergenerational Learning, Adult Education, Mentorship, Nigeria.

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INTRODUCTION

In Nigeria, libraries are increasingly recognised as critical institutions for promoting digital literacy among a diverse population of users drawn from different generational backgrounds. As Baby Boomers, Generation X, Millennials, and Generation Z converge in public, academic, and community library settings, librarians and information professionals are confronted with the challenge of addressing varying levels of technological proficiency, learning preferences, and expectations regarding access to digital information. While younger generations generally demonstrate greater familiarity with emerging technologies, older generations contribute rich life experiences, critical perspectives, and practical wisdom that can enrich learning processes. This intergenerational diversity presents both opportunities and challenges for libraries seeking to enhance digital literacy and lifelong learning.

To bridge this generational divide, George, Baskar and Srikaanth (2024) state that transformative educational approaches that foster collaboration and mutual learning are essential. Libraries in Nigeria can adopt adaptive digital literacy strategies, harness emerging technologies, and create inclusive learning environments that encourage equitable participation across generations. By implementing mentorship programmes, reverse learning techniques, and culturally responsive instructional approaches, libraries can strengthen intergenerational

knowledge exchange and promote inclusive access to digital competencies. Furthermore, ensuring equitable access to digital literacy initiatives is crucial, particularly in rural and underserved communities where digital inequalities persist. Providing adequate technological infrastructure, internet connectivity, digital resources, and user education programmes will empower individuals of all ages to navigate digital environments effectively. This paper therefore explores strategies through which libraries can bridge generational gaps in digital literacy and offers practical recommendations for creating inclusive learning environments that support lifelong learning.

Baby Boomers, born between 1946 and 1964, experienced a post-war economic boom, resulting in a generation that values hard work, loyalty, and stability (Marzo, 2024). They often prefer traditional learning environments characterized by face-to-face instruction, structured guidance, and step-by-step learning processes. Within the context of library-based digital literacy programmes in Nigeria, Baby Boomers may encounter difficulties adapting to technology-mediated services such as electronic databases, online catalogues, digital repositories, and virtual learning platforms. However, Yu and Guo (2023) noted that Baby Boomers bring valuable life experiences, a strong work ethic, and leadership skills that can significantly enhance intergenerational learning. Libraries can leverage these strengths by developing mentorship initiatives in which Baby Boomers share professional experiences and practical knowledge while receiving support in acquiring digital competencies from younger users.

To bridge the divide effectively, Blomqvist, Ruuskanen, Niemi and Nyyssönen (2000) noted that adult learning programmes should incorporate flexible learning models that accommodate the preferences of Baby Boomers. Accordingly, libraries can adopt blended digital literacy programmes that combine face-to-face instruction with online learning resources to facilitate their transition into technology-enhanced environments (Akinyooye & Fajimi, 2022; Ojo & Omoregie, 2018). Additionally, Cheng and Lyu (2024) opined that workshops and training sessions focused on digital literacy can empower Baby Boomers to engage confidently with digital information systems and online learning platforms. By promoting cross-generational dialogue and recognizing the unique contributions of Baby Boomers, libraries can create collaborative learning environments that benefit users across age groups.

Generation X, born between 1965 and 1980, according to Aemmi and Karimi Moonaghi (2017), is characterised by independence, adaptability, and a strong desire for work-life balance. Having witnessed the emergence of personal computers and the early internet, they tend to be relatively comfortable with digital technologies compared to Baby Boomers. In a related development, Andreoletti and Howard (2018) observed that Generation X learners often prefer self-directed learning experiences and value practical knowledge applicable to their professional and personal lives. Libraries can support this generation through flexible digital literacy programmes that offer both online and face-to-face learning opportunities. Such initiatives align with their preference for autonomy while encouraging continuous learning.

To foster intergenerational collaboration, libraries can leverage Generation X's technological competence to mentor older adults in the use of digital technologies while simultaneously benefiting from the experiences of older generations. Providing opportunities for experiential learning, problem-solving activities, and peer collaboration can create dynamic library learning environments (Augustin & Freshman, 2016; Knowles, 1984). Additionally, libraries can enhance participation by offering digital badges, certifications, and career-oriented digital skills programmes. By cultivating a learning ecosystem that values experience,

adaptability, and lifelong learning, libraries in Nigeria can effectively bridge generational divides in digital literacy.

Millennials, born between 1981 and 1996, are characterised by their familiarity with technology, preference for collaborative learning, and desire for immediate feedback. Boulton-Lewis and Tam (2018) opined that, as digital natives, Millennials often seek interactive and engaging learning experiences that integrate multimedia and real-world applications. In library settings, their affinity for technology provides opportunities to expand innovative digital literacy services through mobile applications, online tutorials, virtual reference services, makerspaces, and collaborative learning platforms. Their commitment to professional growth and lifelong learning positions them as valuable contributors to intergenerational digital literacy initiatives.

To bridge generational gaps, libraries should incorporate gamified learning experiences, virtual simulations, and collaborative online platforms to engage Millennials effectively (Cabanillas, 2011). Facilitating cross-generational mentorship programmes in which Millennials assist Baby Boomers in navigating digital technologies while benefiting from the latter's practical experiences can foster reciprocal learning. Additionally, incorporating feedback mechanisms and digital certification opportunities can improve their learning experiences. Through inclusive and technology-driven services, libraries can harness Millennials' strengths to promote digital inclusion and intergenerational collaboration.

Generation Z, born between 1997 and 2012, according to Andreoletti and Howard (2018), represents the most digitally connected generation, demonstrating preferences for visual, interactive, and on-demand learning experiences. They are highly adept at using digital technologies for learning, communication, and problem-solving, often engaging with information through videos, social media platforms, and gamified applications. In the Nigerian context, libraries serving Generation Z users should provide flexible and personalised digital literacy programmes that incorporate emerging technologies such as virtual reality (VR), augmented reality (AR), and artificial intelligence (AI).

To bridge the generational divide, Cath, Wachter, Mittelstadt, Taddeo and Floridi (2018) observed that educational programmes can leverage Generation Z's digital fluency through technology-enabled collaborative projects and digital storytelling initiatives. Libraries can promote intergenerational learning by establishing mentorship programmes in which Generation Z users support older generations in developing digital competencies while gaining practical wisdom and life experiences in return. Providing opportunities for project-based learning and peer collaboration can further enhance engagement. By embracing technological innovation and fostering inclusive, experiential learning environments, libraries in Nigeria can play a transformative role in advancing digital literacy, bridging generational divides, and promoting lifelong learning for all members of society.

Statement of the Problem

Adult education in Nigeria is expected to promote lifelong learning and empower individuals across different age groups to acquire relevant knowledge, competencies, and skills needed for personal, social, and economic development. Similarly, libraries are increasingly recognised as vital institutions for advancing digital literacy by providing access to information resources, digital technologies, internet facilities, and user education programmes that support continuous learning. However, the coexistence of different generations within adult learning and library environments has created a significant divide in digital literacy acquisition and utilisation. Younger learners generally favour interactive, technology-driven approaches and adapt more readily to digital platforms, whereas older learners often encounter difficulties in

using digital tools and coping with the rapid transformation of information and educational technologies. Traditional teaching methods and conventional library services, which remain predominant in many Nigerian institutions, have not adequately addressed these contrasting needs or fostered effective intergenerational learning.

The situation is further compounded by inadequate training of adult educators and librarians in digital pedagogy, poor integration of digital resources into educational and library services, limited technological infrastructure, and the absence of deliberate strategies tailored to multigenerational learners and library users. Consequently, many adult learners are unable to fully develop the digital competencies required to participate effectively in contemporary educational, occupational, and social environments. This challenge has far-reaching implications for lifelong learning, workforce productivity, social inclusion, and equity in access to information. Therefore, there is an urgent need to identify practical approaches through which adult education institutions and libraries can collaborate to bridge the generational divide, strengthen digital literacy initiatives, and create inclusive learning environments that empower individuals of all ages to thrive in an increasingly digital society.

Research Questions

1. How can libraries utilise adaptive instructional approaches to bridge the generational divide in digital literacy among adult learners in Nigeria?
2. What role do mentorship programmes and reverse learning techniques implemented through libraries play in fostering intergenerational digital literacy and lifelong learning?
3. How can library-based digital literacy programmes improve adult learners' access to information resources, digital technologies, and educational opportunities in Nigeria?
4. What challenges do libraries and information professionals encounter in implementing intergenerational digital literacy initiatives for adult learners in Nigeria?

Review of literature

Transformative Learning Theory by Jack Mezirow, (1991)

Transformative Learning Theory emphasizes critical reflection, rational discourse, and perspective transformation as essential processes in adult learning. It explains how learners reassess deeply held assumptions and reconstruct meaning through reflective engagement and dialogue. In intergenerational learning contexts, this theory is particularly relevant because it enables learners from different age groups to question existing beliefs, appreciate diverse perspectives, and adapt to evolving learning environments. Within the Nigerian context, libraries play a crucial role in supporting this process by providing access to diverse information resources, digital literacy training, and learning spaces that encourage reflection, inquiry, and knowledge sharing. Through library-based user education and digital engagement programmes, learners are better equipped to develop open-mindedness and inclusivity across generations.

Social Learning Theory by Albert Bandura (1941)

Social Learning Theory explains learning as a process that occurs through observation, imitation, and modelling within a social environment. It highlights the importance of interaction, shared experiences, and peer influence in the acquisition of knowledge and skills. In adult education, this theory strongly supports mentorship and reverse learning strategies, where older and younger learners learn from one another through guided interaction. Libraries in Nigeria strengthen this process by serving as collaborative learning hubs where digital

literacy programmes, peer tutoring, and technology-assisted training sessions are implemented. Through library-facilitated digital literacy initiatives, users observe and practice digital skills such as information retrieval, database use, and online communication, thereby enhancing their competence across generations.

Conceptual Framework

The following concepts are reviewed in line with the research: Intergenerational Learning, Adult Education, Libraries:

Adaptive Teaching

Adaptive teaching involves tailoring instructional methods to meet the diverse needs of learners. It acknowledges that individuals have different learning preferences, backgrounds, and experiences. In adult education programs in Nigeria, Aemmi and Karimi Moonaghi (2017) observed that adaptive teaching is essential for addressing the generational divide. Baby Boomers may prefer traditional, lecture-based learning, while Gen Z learners may favor interactive, technology-driven experiences. Adaptive teaching strategies, including personalized learning plans, differentiated instruction, and the use of multimedia resources, can ensure that each learner's needs are met (Yu and Guo, 2023). Moreover, George, Baskar and Srikaanth (2024) stated that educators can utilize learning management systems (LMS) that offer customizable learning paths. These platforms can enable students to access content in various formats, engage in self-paced learning, and receive real-time feedback. Instructors can also apply formative assessments to monitor progress and adjust teaching methods accordingly. By employing adaptive teaching strategies, adult education programs in Nigeria may enhance learner engagement, satisfaction, and academic success across all generations.

Digital Literacy

Digital literacy is the ability to effectively use digital tools and resources for learning, communication, and problem-solving. In the Nigerian adult education landscape, Marzo (2024) noted that fostering digital literacy is crucial for bridging the generational divide. While Gen Z and Millennials are typically comfortable with digital platforms, Baby Boomers and some Gen X learners may face challenges in navigating online learning environments. Promoting digital literacy programs that offer hands-on training and personalized support can empower all learners to engage confidently with technology. Additionally, Aemmi and Karimi Moonaghi (2017) stated that digital literacy initiatives should cover essential skills such as navigating learning management systems, conducting online research, and using collaboration tools. Incorporating peer mentorship programs, where tech-savvy learners assist those with limited digital proficiency, can foster inclusive learning environments. By enhancing digital literacy across generations, adult education programs in Nigeria may facilitate equitable access to educational opportunities and promote lifelong learning.

Mentorship Programs

Mentorship programs are an effective approach to bridging the generational divide in adult education. These programs involve experienced individuals guiding and supporting less experienced learners in their personal and professional development. In Nigeria, mentorship programs can pair Baby Boomers and Gen X learners with Millennials and Gen Z learners, fostering knowledge exchange and mutual learning. While older generations provide career insights, leadership guidance, and industry knowledge, younger generations offer digital skills and contemporary perspectives (George, Baskar & Srikaanth, 2024). To ensure the success of mentorship programs, adult education institutions should provide structured mentorship

frameworks that include goal setting, regular check-ins, and feedback mechanisms. Additionally, leveraging virtual mentorship platforms can enhance accessibility and facilitate continuous engagement. Through mentorship, Cheng, Lyu, Li and Shiu (2021) opinioned that participants may build valuable relationships, gain diverse perspectives, and enhance their learning experiences. Ultimately, mentorship programs contribute to the development of well-rounded, empowered learners across generations.

Research Methodology

This study adopted a descriptive survey research design to examine the role of libraries in bridging the generational divide in adult education through digital literacy initiatives in Nigeria. The design was considered appropriate because it allows for the collection of data from a large and diverse group of respondents, enabling a comprehensive understanding of their experiences and perceptions. The population of the study comprised adult learners, librarians, educators, and administrators involved in adult and community education programmes across selected institutions and libraries in Nigeria. A total of 1,000 individuals constituted the study population, from which a sample of 150 respondents was selected using stratified random sampling technique to ensure fair representation across generational groups and professional categories. Data were collected using a structured questionnaire titled *"Bridging the Generational Divide in Adult Education: Library and Digital Literacy Questionnaire."* The instrument was validated by three experts in Measurement and Evaluation, Adult Education, and Library and Information Science. Their inputs ensured clarity, relevance, and alignment with the research objectives. The data collected were analyzed using descriptive statistics such as frequency counts, percentages, means, and standard deviation. The results were used to answer the research questions and draw conclusions on how libraries can enhance digital literacy and intergenerational learning in Nigeria.

RESULTS

Demographic Information of RespondentsTable 1: *Demographic Information of Respondents* Gender

Option	Number of Respondents	Percentage
Male	57	38.0%
Female	93	62.0%
Total	**150**	**100.0%**
	Age	
Option	**Number of Respondents**	**Percentage**
Below 30 years	12	8.0%
30-39 years	45	30.0%
40-49 years	75	50.0%
50-59 years	18	12.0%
Total	**150**	**100.0%**
	Educational Qualification	
Option	**Number of Respondents**	**Percentage**
SSCE	115	76.7%
NCE	22	14.6%
OND	3	2.0%
BSc/BA	10	6.7%
Total	**150**	**100.0%**
	Occupation	
Option	**Number of Respondents**	**Percentage**
Adult Learner	100	66.7%
Educator	40	26.7%
Administrator	10	6.7%
Total	**150**	**100.0%**
	Years of Experience	
Option	**Number of Respondents**	**Percentage**
Less than 1	28	18.7%
1-5 years	80	53.3%
6-10 years	40	26.7%
Above 10 years	2	1.3%
Total	**150**	**100.0**

Source: Researcher, 2026

The demographic results reveal that most respondents were women, making up about two-thirds of the sample. In terms of age, the largest group fell within 40–49 years, showing that middle-aged adults formed the core of the participants. Educationally, the majority held SSCE qualifications, while only a small proportion had higher degrees such as NCE, OND, or BSc/BA. Looking at their roles, most respondents identified as adult learners, with fewer educators and very few administrators. Experience in adult education was strongest among those with one to five years of involvement, suggesting that while many had some exposure, only a handful had been engaged for more than a decade. Altogether, the profile shows that the study was shaped largely by middle-aged female adult learners with modest qualifications and moderate experience in adult education.

Research Question 1

How can libraries utilise adaptive instructional approaches to bridge the generational divide in digital literacy among adult learners in Nigeria?

Table 2: Mean and standard deviation of respondents on how libraries utilise adaptive instructional approaches to bridge the generational divide in digital literacy among adult learners in Nigeria

S/N	Item Statement	SA	A	D	SD	$\bar{x}$	SD	Remark
1	Adaptive teaching methods accommodate the diverse learning needs of different generations.	91	59	0	0	3.61	0.49	Agree
2	Digital tools and technologies enhance intergenerational learning experiences.	89	61	0	0	3.59	0.49	Agree
3	Educators effectively use adaptive teaching techniques to engage both younger and older learners.	23	47	60	20	2.49	0.91	Disagree
4	Mentorship programs support knowledge exchange between generations.	75	70	5	0	3.47	0.56	Agree
5	Reverse learning techniques (younger teaching older) foster mutual learning.	72	71	7	0	3.43	0.58	Agree
6	Cultural and generational experiences are incorporated into the learning process.	70	73	7	19	3.42	0.58	Agree
7	Educators receive adequate training on adaptive teaching strategies.	10	52	69	19	2.35	0.79	Disagree
8	Digital literacy programs improve adult learners' access to educational resources.	78	71	1	0	3.51	0.52	Agree
9	Collaborative learning projects promote intergenerational knowledge sharing.	74	71	5	0	3.46	0.56	Agree
10	Learners of different generations interact positively in adaptive learning environments.	78	67	5	0	3.49	0.56	Agree
	Cluster Mean					**3.28**	**0.35**	**Agree**

Key: $\bar{x}$ = Mean, SD = Standard Deviation.

The results in Table 2 indicate that 80% of the items were rated above the benchmark of 2.50, reflecting general agreement that adaptive teaching methods can help bridge the generational divide in Nigerian adult education. The most strongly endorsed strategies were accommodating diverse learning needs ($\bar{x}$ = 3.61, SD = 0.49, 96%) and enhancing intergenerational learning through digital tools ($\bar{x}$ = 3.59, SD = 0.49, 95%). Mentorship programmes ($\bar{x}$ = 3.47, SD = 0.56, 92%) and reverse learning techniques ($\bar{x}$ = 3.43, SD = 0.58, 91%) also attracted high support. On the other hand, only 2 items (20%) fell below the acceptance threshold: engaging all age groups effectively ($\bar{x}$ = 2.49, SD = 0.91, 62%) and adequate training for educators ($\bar{x}$ = 2.35, SD = 0.79, 59%). Overall, the findings suggest that while most adaptive methods are viewed positively, challenges remain in ensuring balanced participation and improving educator readiness.

Research Question 2

What role do mentorship programmes and reverse learning techniques implemented through libraries play in fostering intergenerational digital literacy and lifelong learning?

Table 3: Mean and standard deviation of respondents on the role mentorship programmes and reverse learning techniques implemented through libraries play in fostering intergenerational digital literacy and lifelong learning

S/N	Item Statement	SA	A	D	SD	$\bar{x}$	SD	Remark
1	Availability of mentorship programs to bridge generational learning gaps	81	67	2	0	3.53	0.53	Agreed
2	Effectiveness of mentorship programs in promoting knowledge transfer	84	64	2	0	3.55	0.53	Agreed
3	Provision of structured mentorship programs to encourage intergenerational learning	74	70	6	0	3.45	0.57	Agreed
4	Support for informal mentorship relationships within adult education settings	20	59	56	15	2.56	0.85	Agreed
5	Recognition and rewards for effective mentorship programs	18	45	72	15	2.44	0.83	Disagreed
6	Participation of both younger and older learners in mentorship programs	74	72	4	0	3.47	0.55	Agreed
7	Promotion of mentorship as a continuous learning strategy	73	73	4	0	3.46	0.55	Agreed
8	Impact of mentorship on skill development across generations	79	70	1	0	3.52	0.51	Agreed
9	Availability of training for mentors and mentees	15	47	79	9	2.45	0.76	Disagreed
10	Institutional support for formal and informal mentorship programs	70	74	6	0	3.43	0.57	Agreed
	Cluster Mean					**3.19**	**0.32**	**Agreed**

Key: $\bar{x}$ = Mean, SD = Standard Deviation.

The results presented in Table 3 show that four key items had mean scores above the 2.50 benchmark, indicating agreement among respondents. These include the effectiveness of mentorship programs in promoting knowledge transfer ($\bar{x}$ = 3.55, SD = 0.53), availability of mentorship programs to bridge generational learning gaps ($\bar{x}$ = 3.53, SD = 0.53), provision of structured mentorship programs to encourage intergenerational learning ($\bar{x}$ = 3.45, SD = 0.57), and support for informal mentorship relationships within adult education settings ($\bar{x}$ = 2.56, SD = 0.85). Among these, the most highly rated was the effectiveness of mentorship programs in promoting knowledge transfer. Overall, the findings suggest that mentorship programs and reverse learning techniques play important roles in fostering intergenerational learning in Nigerian adult education.

Research Question 3

How can library-based digital literacy programmes improve adult learners' access to information resources, digital technologies, and educational opportunities in Nigeria?

Table 4: Mean and standard deviation of respondents on how library-based digital literacy programmes improve adult learners' access to information resources, digital technologies, and educational opportunities in Nigeria

S/N	Item Statement	SA	A	D	SD	$\bar{x}$	SD	Remark
1	Availability of digital literacy programs for adult learners	75	66	9	0	3.44	0.61	Agreed
2	Effectiveness of digital literacy programs in improving access to online educational resources	79	67	4	0	3.50	0.55	Agreed
3	Access to digital devices and internet services through digital literacy programs	64	77	9	0	3.37	0.60	Agreed
4	Support for adult learners in developing basic computer skills through digital literacy programs	68	82	0	0	3.45	0.50	Agreed
5	Provision of tailored digital literacy training for different educational levels	55	72	23	0	3.21	0.69	Agreed
6	Collaboration between educational institutions and tech organizations to provide digital literacy training	61	72	17	0	3.29	0.66	Agreed
7	Integration of digital literacy into adult education curricula	61	78	11	0	3.33	0.61	Agreed
8	Accessibility of digital literacy programs for learners in rural and underserved areas	60	77	13	0	3.31	0.63	Agreed
9	Impact of digital literacy on improving adult learners' research and learning capabilities	71	73	6	0	3.43	0.57	Agreed
10	Support from government and NGOs in promoting digital literacy for adult education	54	81	15	0	3.26	0.63	Agreed
	Cluster Mean					**3.36**	**0.35**	**Agreed**

Key: $\bar{x}$ = Mean, SD = Standard Deviation.

Result as presented in Table 4 shows that items 1-10 have mean ratings above the 2.50 set as benchmark for accepting an item. This implies that respondents agreed that availability of digital literacy programs for adult learners ($\bar{x}$ = 3.44, SD = 0.61), effectiveness of digital literacy programs in improving access to online educational resources ($\bar{x}$ = 3.50, SD = 0.55), access to digital devices and internet services through digital literacy programs ($\bar{x}$ = 3.37, SD = 0.60), and support for adult learners in developing basic computer skills through digital literacy programs ($\bar{x}$ = 3.45, SD = 0.50) among others are the ways digital literacy programs improve access to educational resources for adult learners in Nigeria. From the result, effectiveness of digital literacy programs in improving access to online educational resources ($\bar{x}$ = 3.50, SD = 0.55) is the highest, follow by support for adult learners in developing basic computer skills through digital literacy programs ($\bar{x}$ = 3.45, SD = 0.50). Overall, the result shows that there are various ways digital literacy programs improve access to educational resources for adult learners in Nigeria.

Research Question 4

What challenges do libraries and information professionals encounter in implementing intergenerational digital literacy initiatives for adult learners in Nigeria?

Table 5: Mean and standard deviation of respondents on the challenges educators face when implementing intergenerational learning approaches in Nigerian adult education settings

S/N	Item Statement	SA	A	D	SD	$\bar{x}$	SD	Remark
1	Limited resources and inadequate funding hinder effective implementation of intergenerational learning approaches.	76	74	0	0	3.51	0.50	Agreed
2	Educators face difficulties in addressing the diverse learning needs of different age groups.	72	70	8	0	3.43	0.60	Agreed
3	Lack of adequate training and professional development programs for educators affects the success of intergenerational learning.	78	68	4	0	3.49	0.55	Agreed
4	Resistance to intergenerational learning approaches from adult learners or younger participants poses challenges.	67	69	14	0	3.35	0.65	Agreed
5	Technological barriers limit the effective application of intergenerational learning in adult education settings.	75	70	5	0	3.47	0.56	Agreed
6	Cultural and generational differences create communication and collaboration challenges.	69	70	11	0	3.39	0.62	Agreed
7	Time constraints and scheduling conflicts make it difficult to implement intergenerational learning programs.	62	82	6	0	3.37	0.56	Agreed
8	Lack of institutional support and policies promoting intergenerational learning.	78	59	13	0	3.43	0.65	Agreed
9	Inadequate access to digital resources and learning technologies for older learners.	75	67	8	0	3.45	0.60	Agreed
10	Educators face challenges in assessing the effectiveness and impact of intergenerational learning programs.	53	85	12	0	3.27	0.60	Agreed
	Cluster Mean					**3.42**	**0.37**	**Agreed**

Key: $\bar{x}$ = Mean, SD = Standard Deviation.

Result as presented in Table 5 shows that items 1-10 have mean ratings above the 2.50 set as benchmark for accepting an item. This implies that respondents agreed that limited resources and inadequate funding hinder effective implementation of intergenerational learning approaches ($\bar{x}$ = 3.51, SD = 0.50), educators face difficulties in addressing the diverse learning needs of different age groups ($\bar{x}$ = 3.43, SD = 0.60), lack of adequate training and professional development programs for educators affects the success of intergenerational learning ($\bar{x}$ = 3.49, SD = 0.55), and resistance to intergenerational learning approaches from adult learners or younger participants poses challenges ($\bar{x}$ = 3.35, SD = 0.65) among others are the challenges educators faced when implementing intergenerational learning approaches in Nigerian adult

education settings. From the result, limited resources and inadequate funding hinder effective implementation of intergenerational learning approaches ($\bar{x}$ = 3.51, SD = 0.50) is the highest challenge, follow by lack of adequate training and professional development programs for educators affects the success of intergenerational learning ($\bar{x}$ = 3.49, SD = 0.55). Overall, the result shows that there are challenges educators face when implementing intergenerational learning approaches in Nigerian adult education settings.

RECOMMENDATIONS

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

1. Libraries and adult education centres should strengthen the integration of digital literacy programmes into their core services to enhance access to information resources across all age groups.
2. Structured mentorship and reverse learning programmes should be institutionalized within libraries to encourage knowledge exchange between younger and older learners.
3. Government, NGOs, and educational institutions should increase funding for library infrastructure, digital tools, internet access, and learning technologies, especially in rural and underserved areas.
4. Continuous professional development programmes should be provided for librarians and educators to equip them with modern digital pedagogy and intergenerational teaching skills.

CONCLUSION

This study concludes that libraries play a vital and transformative role in bridging the generational divide in adult education through digital literacy initiatives in Nigeria. The integration of adaptive learning approaches, mentorship programmes, and reverse learning strategies within library services enhances collaboration among different generations of learners. Although these strategies have proven effective in promoting inclusive learning and digital competence, their implementation is constrained by challenges such as inadequate funding, infrastructural deficits, and limited professional capacity. Addressing these challenges through targeted investment, policy support, and capacity building will significantly strengthen the role of libraries in fostering equitable access to digital knowledge. Ultimately, libraries remain essential institutions for promoting lifelong learning, digital inclusion, and intergenerational knowledge exchange in Nigeria's evolving educational landscape.\

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Perceived Effect of Agricultural Waste on the Productivity of Degraded Land for Efficient Crop Production in Cross River North, Nigeria

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Abstract

The study investigated the perceived effect of agricultural waste on the productivity of degraded land for efficient crop production in Cross River North, Nigeria. Survey research design was adopted for the study. Two objectives, two research questions and two hypotheses were formulated for the study. The population for the study was 30,874 comprises of 30,848 registered arable farmers and 26 agricultural extension agents across the Northern Cross River State. Sample size of 395 was determined using the Taro Yamani. The study adopted proportionate sampling techniques and simple random sampling. The instrument for data collection was a structured questionnaire titled: "Perceived effect of Agricultural Waste on the productivity of degraded land Questionnaire (PEAWOPDLQ)". The instrument was subjected to face and content validity by three experts all from Joseph Sarwuan Tarka University, Makurdi. The instrument was trial tested using (25) farmers and (5) extension agents in Benue State, Data collected were analysed using Cronbach Alpha reliability method which gave a coefficient of 0.82. Three hundred and ninety-five (395) copies of questionnaires were administered to the respondents; with the aid of (3) research assistants who are familiar with the study area. At the point of retrieval, only 380 were returned which were used for data analysis. The instruments used was based on four-point rating scale of Strongly Agreed (SA), Agree (A), Disagree (A), and Strongly Disagree (SD) with a corresponding rating of 4, 3, 2 and 1 respectively. Mean and Standard Deviation were used to answer the research questions while t-test was used to test the hypotheses at 0.05 level of significance. Based on the findings of the study, it was therefore concluded that agro-industrial wastes and crop residues positively affects the productivity of degraded land for efficient crop production in the study area. It was therefore, recommended that farmers should adopt integrated soil fertility management practices by using agro-industrial waste as a means of enriching the soil for increased production.

Keywords: Agricultural waste, Productivity, degraded land & efficient crop production.

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INTRODUCTION

The global agriculture industry has been under pressure due to the increased demand for food production, rising populations, and the depletion of natural resources. Agricultural sustainability has become a core theme of international discussions surrounding climate change, food security, and rural employment. To maintain the productivity of agricultural land, various practices have been employed, such as the use of agricultural waste to increase its productivity. These methods aim at enhancing soil fertility, maximizing land use, and increasing crop yields (Kassam *et al.,* 2019). Globally, agricultural waste has garnered attention as an underutilized resource for improving soil fertility and reducing waste disposal issues. It includes by-products such as crop residues, animal manure, agro-industrial waste, horticultural waste and compost waste. The use of agricultural waste in soil management has been advocated as part of a circular economy approach, contributing to sustainable agriculture and mitigating the negative environmental impacts of farming (Zhu *et al.,* 2020). In Africa, agriculture remains a crucial sector, employing more than 60% of the population and contributing

significantly to gross domestic products (GDP) in many countries (Diao *et al.,* 2016). The use of agricultural waste in Cross River, Nigeria and Africa as a whole however, presents unique challenges such as, poor waste management, lack of infrastructure, and limited access to modern farming technologies. These hinder farmers from maximizing its potential as a result inadequate used of agricultural waste.

Agricultural waste refers to the by-products generated from farming activities, including crop residues, animal manure, and processing waste, agro-industrial waste, horticultural waste and compost waste (Gupta & Sahu, 2020). These waste products, when effectively managed and applied, can act as natural fertilizers that improve soil fertility and enhance crop production (Adediran *et al.,* 2017). Agricultural waste, as part of sustainable farming practices, also contributes to reducing environmental pollution by reusing organic materials that would otherwise become waste. However, in a state such as Cross River North, agricultural waste is often underutilized due to limited knowledge and inadequate infrastructure for proper waste management and productivity of degraded land.

Land degradation is way in which the biophysical or economic productivity of the land reduces as a result of so many factors such as human activities, unsustainable Agriculture, deforestation and natural processes like drought. According to Hang (2018), land degradation is the loss of soil fertility, biodiversity, and natural vegetation which can cause desertification and negatively impact food security, livelihoods and the environment, Land degradation can also be seen as the depletion of soil fertility and a decrease in the productivity of soil which may be permanent or temporary. Soil fertility is a component of overall soil productivity which deals with its available nutrient status, and its ability to provide nutrients out of its own reserves and through external applications for crop production (Adams & Eswaran, 2017). The mere presence of plant nutrients for healthy growth in the form available for plant use makes a soil fertile. The soil is, however, only productive when the various nutrients are in appropriate amounts or ratio. There are many factors that affect the availability of nutrients in soils and ultimately their productivity. So, all these contribute to the unsustainability of soil or its degradation that led to inefficient production.

To enhanced efficient production therefore, agricultural extension agents must step up in the dissemination of knowledge, technology, and best practices, particularly in the fields of agriculture, rural development, and environmental management for optimum crop yields and increased productivity in the area (Pingali, 2020).

Statement of the Problem

Agriculture remains a key sector for both food security and employment, particularly in developing countries like Nigeria, where a significant portion of the population relies on farming for their livelihood. In Cross River North for example, agriculture is the mainstay of the rural economy, yet many farmers struggle with declining productivity due to soil degradation, inadequate land management practices, and limited access to modern agricultural inputs such as organic fertilizers (Adams & Eswaran, 2017). These challenges have contributed to low agricultural productivity, which threatens both the livelihoods of farmers and the sustainability of arable land in the area.

The researcher personal investigation from the farmers reveals that there is knowledge void regarding how the use of agricultural waste can influence not only soil fertility but also improve production. Given that the productivity of arable land directly impacts farmers' livelihoods. The researcher further investigation confirm that farmers have inadequate knowledge on how improved land management practices can support employment generation in agriculture, especially in areas with high rates of rural unemployment. It is on this note that

the researcher sought to study the perceived effect of agricultural wastes on the productivity of degraded land for efficient crop production in Cross River North Nigeria.

Objectives of the study

The main objective of this study was to ascertain the perceived effect of agricultural wastes on the productivity of degraded land for efficient crop production in Cross River North. Specifically, the study sought to:

1. determine the perceived effect of agro-industrial waste on degraded land in Cross River North.
2. determine the perceived effect of crop residues on degraded land in Cross River North.

Research Questions

1. What are the perceived effects of agro-industrial waste on degraded land in Cross River North?
2. What are the perceived effects of crop residues on degraded land in Cross River North?

Hypotheses

The following research hypotheses were formulated and tested at 0.05 level of significance

1. There is no significant difference between the mean ratings of farmers and extension agents on the effect of agro-industrial waste on degraded land in Cross River North.
2. There is no significant difference between the mean ratings of farmers and extension agents on the effect of crop residues on degraded land in Cross River North.

METHODOLOGY

The study adopted survey research design for the study. A survey research design is a form of research in which data is collected by use of formulated questions in other to eliciting data from the subjects on the topic understudy. The population of the study was 30,874 comprised of 30,848 registered farmers and 26 agricultural extension agents in Cross River North. The sample size for the study was three hundred and ninety-five (395) comprised of three hundred and sixty-nine farmers and twenty-six extension agents was determined using the Taro Yamani formular for sample determination. A proportionate sampling technique was used for the study. In other hand dividing the population into strata before selection after which simple random sampling is apply this is to ensured equal chance of being selected. The instrument for data collection titled: "Perceived effect of Agricultural Waste on the productivity of degraded land Questionnaire (PEAWOPDLQ)", which was designed in line with the research questions and hypotheses raised for the study. A rating scale of four points was used as response to questions. The options were: Strongly Agreed (SA), Agree (A), Disagree (A), and Strongly Disagree (SD) with a corresponding rating of 4, 3, 2 and1respectively. The instrument was subjected to face and content validated by three experts; one from the department of Agricultural education, one from the department of agronomy and one from the department of Guidance and counselling with a specialist in test and measurement all from Joseph Sarwuan Tarka University Makurdi, Benue State, Nigeria. The questionnaire was subject to a trial testing with on twenty-five (25) farmers and five (5) extension agents in Benue State. Data collected from the trial testing were analysed using Cronbach Apha reliability method which give coefficient of 0.82, indicating that the instruments are reliable. The reliability was computed for the whole instruments. The instrument was administered by the researcher personally with the help of 3 research assistants who are familiar with the study area. Three hundred and ninety-five (395) copies of questionnaires were administered to the

respondents. The questionnaire was completed and collected by the researcher and the research assistant after two days and at the point of retrieval, only 380 was returned which was used for data analyses. Data generated from this study was analysed using descriptive statistics such as mean and standard deviation to answer the research questions and inferential statistics of t-test to test the null hypotheses at 0.05 level of significance. The criterion mean of 2.50 and above were considered as agreed while less than 2.50 were considered as disagree. In testing the null hypotheses if the P-value calculated is less than .05 level of significance, the null hypothesis was rejected otherwise accepted.

Results

The results are presented according to the research questions that guided the study.

Research Question 1

What are the perceived effects of agro-industrial waste on degraded land for efficient crop production in Cross River North?

Table 1 Mean Ratings and Standard Deviation of the Respondents on the Perceived Effect of Agro-industrial Wastes on the Productivity of Degraded Land for Efficient Crop Production(N=356, 24)

S/N	Item statement	$\ddot{X}_F$	S_F	$\ddot{X}_A$	S_A	$\ddot{X}_g$	S_g	RMK
1	Agro-industrial waste adds organic matter, which enhances soil fertility by releasing essential nutrients like nitrogen, phosphorus, and potassium as it decomposes	3.68	.64	3.67	.66	3.675	.65	A
2	Improves soil porosity	3.68	.62	3.67	.65	3.675	.63	A
3	Enhances drainage in compacted soils.	3.64	.62	3.63	.65	3.635	.63	A
4	Improve soil aeration	3.67	.65	3.66	.67	3.665	.66	A
5	Enhance moisture retention and aggregation in sandy soils	3.66	.62	3.65	.65	3.655	.635	A
6	Adding composted agro-industrial waste helps degraded soils retain more moisture, making them more resilient during dry periods.	3.60	.68	3.60	.70	3.6	.69	A
7	Serves as a source of energy and carbon for beneficial soil microorganisms, increasing microbial biomass and diversity.	3.59	.69	3.58	.71	3.585	.70	A
8	Agro-industrial waste leads to microbial activities that is crucial for nutrient cycling	3.61	.69	3.60	.71	3.605	.70	A
9	Some composted agro-industrial wastes can reduce harmful soil microorganisms while increasing the population of beneficial ones, which act as biocontrol agents.	3.62	.62	3.61	.64	3.615	.63	A
10	Biochar, a carbon-rich material created by heating agro-waste has a large surface area and high adsorption capacity which can immobilize heavy metals in contaminated soil, reducing their bioavailability for plant uptake	3.64	.66	3.63	.68	3.635	.67	A
11	Through conversion of biomass into stable biochar, carbon is stored in the soil for long periods which helps mitigate climate change by preventing the release of carbon dioxide	3.57	.69	3.57	.71	3.57	.70	A

Keys: X_F- mean of farmers, X_A- mean of extension agents, S_f- standard deviation of farmers, S_A-standard deviation of extension agents, A- Agree

The results presented in Table 1 showed that all the items had their grand mean scores ranging from 3.57 to 3.67 which are above the cut off mean of 2.50. This means that all the items are the perception of the farmers and extension agents on the effects of agro-industrial wastes on the productivity of degrades land for efficient crop production in Cross River North zone. The result also shows that the standard deviation is close to each other and not far from the mean. This implies that the responses of the respondents are not far from each other.

Hypothesis 1: There is no significant difference between the mean ratings of farmers and extension agents on the perceived effect of agro-industrial waste on the productivity of degraded land for efficient crop production in Cross River North.

Table 2: t-Test Result of the Respondents on the Perceived Effect of Agro-industrial wastes on the Productivity of Degraded Land for Efficient Crop Production

STATUS	N	Mean	Std. Deviation	Std. Error Mean	Df	Sig	t-cal	Alpha value	Remark
Farmers	356	3.63	0.65	.32	378	.269	1.107	.05	NS
Ext. Agents	24	3.62	0.68	2.19					

Keys: N= Number of respondents, Std = Standard deviation, df = degree of freedom, Sig. = P-value; t-cal = t-calculated value; NS = No Significant. **Source:** *Field survey, 2025*

The result presented in Table 2 shows that the p-value (.269) is higher than the alpha value of .05, therefore accepting the null hypothesis stated. This means that there is no significant difference between the mean response of farmers and agricultural extension agents on the perceived effects of agro-industrial waste on the productivity of degraded land for efficient crop production in Cross River North.

Research question 2

What are the perceived effects of crop residue on degraded land for efficient crop production in Cross River North?

Table 3: Mean Ratings and Standard Deviation of the Respondents on the Perceived Effect of Crop Residue on the Productivity of Degraded Land for Efficient Crop Production (N=356, 24)

S/N	Item statement	$\ddot{X}_F$	S_F	$\ddot{X}_A$	S_A	$\ddot{X}_g$	S_g	RMK
1	The decomposition of crop residues adds organic matter to the soil, which is vital for improving soil structure and fertility.	3.65	.65	3.50	.97	3.575	.81	A
2	Crop residues act as a mulch, improving infiltration, thereby increasing soil moisture	3.66	.66	3.51	.97	3.585	.815	A
3	Lowers soil temperature by serving as mulch material	3.64	.65	3.53	.97	3.585	.81	A
4	Crop residue leads to reducing evaporation from the soil surface	3.62	.58	3.62	.57	3.62	.575	A
5	As a protective layer of the soil, crop residue shields the soil from erosion which is a common problem in degraded lands	3.65	.64	3.51	.97	3.58	.805	A

6	The accumulation of organic matter through the residue's decomposition helps create stable soil aggregates	3.64	.64	3.54	.97	3.59	.805	A
7	Crop residues improves porosity by allowing for better water and air movement	3.69	.60	3.50	.97	3.595	.785	A
8	Residues provide food for soil microbes, increasing their population and activity, which is crucial for nutrient cycling and soil health	3.65	.68	3.50	.97	3.575	.825	A
9	As residues decompose, they release essential nutrients back into the soil, contributing to long-term fertility.	3.69	.63	3.52	.97	3.605	.80	A

Keys: X_F- mean of farmers, X_A- mean of extension agents, S_f- standard deviation of farmers, S_A-standard deviation of extension agents, A- Agree

The results in Table 3 shows that all the items had their grand mean scores ranging from 3.57 to 3.59 which is above the cut off mean of 2.50. This means that all the items are the perception of the farmers and extension agents on the effects of crop residues on the productivity of degraded land for efficient crop production in Cross River North zone. The result also shows that the standard deviation is close to each other and not far from the mean. This implies that the responses of the respondents are not far from each other.

Hypothesis 2: There is no significant difference between the mean ratings of farmers and extension agents on the perceived effect of crop residues on the productivity of degraded land for efficient crop production in Cross River North.

Table 4: t-Test Result of the Respondents on the Perceived Effect of Crop Residues on the Productivity of Degraded Land for Efficient Crop Production

STATUS	N	Mean	Std. Deviation	Std. Error Mean	Df	Sig	t-cal	Alpha value	Remark
Farmers	356	3.659167	0.640177	.23592	378	.190	1.313	.05	NS
Ext. Agents	24	3.526111	0.933327	1.58778					

Keys: N= Number of respondents, Std = Standard deviation, df = degree of freedom, Sig. = P-value; t-cal = t-calculated value; NS = No Significant. **Source:** *Field survey, 2025*

The result presented in Table 4 shows that the p-value (.190) is higher than the alpha value of .05, therefore accepting the null hypothesis stated. This means that there is no significant difference between the mean response of farmers and agricultural extension agents on the perceived effect of crop residue on the productivity of degraded land for efficient crop production in Cross River North.

Discussion of Findings

The result of the findings revealed that agro-industrial wastes positively affect the productivity of degraded land such as addition of organic matter to the soil which enhances soil fertility by releasing essential nutrients like nitrogen, phosphorus, and potassium as it decomposes, improves soil porosity, enhances drainage in compacted soils, improve soil

aeration and many more. The result from hypothesis 1 shows that there is no significant difference between the mean ratings of farmers and agricultural extension agents on the perceived effects of agro-industrial waste on the productivity of degraded land for efficient crop production in Cross River North. This is in agreement with Harry *et al*, (2016) who opine that the waste generated from industrial waste increase the soil nutrient when decomposed and also help to improve the productivity of a degraded land. In addition, although a degraded land does not produce but when work on, by increasing it fertility can also be useful to farmers for crop production. On the other hand, Nurah (2022) added that the improvement of a degraded land also led to increase in crop production in the study area. The author added that a land that is no longer productive as a result of being degraded can later become productive when nutrients are added to the soil which also increase the rate of crop production and improved the standard of living of the farmers in that location.

The results also indicated that crop residues positively affect the productivity of degraded land in the study area which include: the addition of organic matter to the soil as a decomposition of crop residues which is vital for improving soil structure and fertility, crop residues act as a mulch, improving infiltration, thereby increasing soil moisture, lowering of soil temperature by serving as mulch material, crop residue leads to reducing evaporation from the soil surface and so on. The findings from the hypothesis reveal that there is no significant difference between the mean response of farmers and agricultural extension agents on the perceived effect of crop residue on the productivity of degraded land for efficient crop production in Cross River North. Crops residue is very essential in improvement of degraded land for crop production such as leaving agricultural remains on the soil surface, which acts as a natural protective covering. This technique has numerous advantages, including: Moisture conservation, weed suppression, temperature control and soil erosion control thereby preserving the nutrients available in the soil (Varank, 2016). While in the opinion of Garzon (2019) Using residue incorporation techniques can help break down surface residues and release nutrients during planting or harvesting activities such as mechanical incorporation: Chisel ploughs, disc harrows, and cultivators can be employed to incorp rate residues into the soil profile, resulting in faster breakdown and nutrient cycling. The author added to effectively manage crop residues and promote conservation agriculture (CA), several key actions are necessary. This includes developing a nation-wide inventory of crop residues and utilizing satellite imagery for accurate estimation. Identifying and evaluating crop residues for various uses, while determining acceptable residue levels based on crop ping techniques, soil, and climate conditions, is crucial to avoid operational issues. Evaluating the cost benefit ratio and socio-economic implications of retaining versus burning residues is essential over short and long-term scales.

CONCLUSION

Based on the findings of the study, it was therefore concluded that agro-industrial wastes and crop residues positively affects the productivity of degraded land for efficient crop production in the study area. In other hand it shows that that there is no significant difference between the mean ratings of farmers and agricultural extension agents on the perceived effect of agro-industrial waste and crop residue on the productivity of degraded land for efficient crop production in Cross River North.

RECOMMENDATIONS

Base on the findings of the study the researcher made the following recommendations:

1. Farmers should adopt integrated soil fertility management practices by using agro-industrial waste as a means of enriching the soil.
2. Crop residue obtained from the farm should be incorporated into the soil for improved soil fertility for better productivity.

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Farm Management Practice Improvement Needs of Teachers of Agricultural Science in Operating Secondary School Farms in Adamawa State, Nigeria

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Abstract

The study determined farm management practice improvement needs of teachers of Agricultural Science in operating secondary school farms in Adamawa State. Descriptive survey research design was use for the study. Two objectives, two research questions and one hypothesis were used for the study. The population for the study is 1266 which is made up of 1173 teachers of Agricultural Science and 93 extension agents across the state. The sample for this study is 303 made up of 93 agricultural extension agents and 210 teachers of Agricultural Science. The sample size was obtained using the Taro Yamane formula. All the 93 extension agents were used for the study while stratified random sampling techniques was used to select 210 teachers for the study. The instrument for data collection was a structured questionnaire titled Farm Practice Needs of Teachers of Agricultural Science Questionnaire (FPINTASQ). The instrument was faced and content validated by five experts, three from Department of Agricultural Education, one from Department of measurement and evaluation and one from Department of Agricultural Extension and Communication all from, Joseph Sarwuan Tarka University Makurdi. The reliability of the instrument was trial tested on 30 teachers of Agricultural Science and 11 extension agents in Taraba State. Data collected from the trial testing were analyzed using Cronbach Apha reliability method which give a coefficient of 0.85 and 0.81 for need and performance respectively indicating that the instruments are reliable. The instrument was administered by the researcher with the help of three (3) research assistant in the study area. 303 copies of questionnaires were administered to the respondents and was collected immediately. A rating scale of four points was used as response options e.g (HN highly needed=4; MN moderately needed=3; SN slightly needed=2; NN not needed and HP high performed-4; AP Average performed -3; Low performed-2; and NP no performed-1) for need and performance categories respectively. Data collected was analyzed using mean and improvement need index (INI) to answer research question while t-test was used to test the null hypothesis at .05 level of significance. Bases on the findings of the study It was discovered that teachers of Agricultural Science in secondary schools need improvement in animal feed production and management as well as keeping of farm records. It was therefore, concluded that improvement needs identified in the study should be used to prepare the in-service training organized by the school management in collaboration with State Secondary Education Board for the training of teachers.

Keywords: Farm Practices, improvement needs, teachers of Agriculture & secondary school farms.

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INTRODUCTION

Farm Management practice as an activity conducted by farmers on a farm in order to produce agricultural products with an inherent and necessary to the operation of a farm include, but not limited to, the collection, transportation, distribution, storage and land application of animal wastes; storage, transportation and many more. According to Gaedena (2024) farm management practices are some of the methods applied in agriculture to help create food for consumers as well as for further processing. Thus, to ensure that more persons are involved in food production, there is need to make agriculture practicable through the school farm.

Teachers of Agriculture in secondary schools therefore need to be competent in farm management practices. These farm management practices according to Brown and Miller (2018) include, soil preparation, animal breeding, feeding, soil fertility maintenance, weed control, field maintenance and others. Mukhtar, *et al* (2021) affirmed that proper farm management practices are synonymous with school farm which encourages innovative discoveries in soil conservation, plant and animal diseases, water management as well as animal feeds management; hence with teachers who are competent in farm management practices, students have the opportunity to observe and practically carry out farm projects in these areas of agriculture under the supervision of the teachers with a view to improve on then. For better delivery therefore, there should be continued improvement of teachers of agricultural science for good agricultural production.

Teachers of agriculture science are those who have passed through preparatory or training programme, certified in the programme and is officially employed to teach in a formal school. Teacher of agricultural science in the view of Koku & Yama, (2022) is a person trained and groomed from teacher preparation institutions to impart quality skills, knowledge and attitudes to students. Similarly, Ndem (2016) stated that teacher of Agricultural Science is a person professionally trained in the field of agriculture science to acquire skills, knowledge, technical know-how and methodology needed for the teaching of Agricultural Science. Teachers of Agricultural Science are those who studies agriculture or related discipline and are employed to implement the curriculum of Agricultural Science in secondary schools. Ifeanyieze *et, al* (2018) articulated that, the implementation of the Agricultural Science curriculum depends on the quality of teachers in the educational sector who are the critical factor in the implementation process. Their expertise and guidance are essential in ensuring that the school farms are well maintained, productive, and provide valuable learning opportunities for students (Micheal *et al,* 2016). Teachers of Agricultural Science must have a proper grasp of the farm practices before delving into the implementation of a practical agricultural curriculum in secondary school farm.

A Secondary school farm is an area especially earmarked for agricultural activities by a secondary school which may be in school or at walking distance to school. It is a farm set up by a school for the purpose of practical teaching and learning of Agricultural Science and its related subjects (Chukwudum & Ogbuchi, 2015). Secondary school farm has been described by Pia, *et, al* (2015) as an outdoor laboratory specifically designed for imparting agricultural knowledge and managerial skills for students in secondary schools through guided practice. Also, Ighakpe (2018) described a secondary school farm as a land marked specifically for agricultural activities by the school for the students. Secondary school farms are a strategy that enhances the availability, utilization, and sustainable access of healthy and local food to school meals to address the nutritional needs of students (Adebayo & Mudaly, 2019). Secondary school farm is a magical place where students come to learn about growing food and to develop practical skills with real-life experiences. The above can be achieved when the teachers possess sufficient farm practice skills which is expected to be updated from time to time Hence the study.

Statement of problem

Ideally, the secondary school farm should be utilized by teachers of Agricultural Science for impacting farm practice skills to the students who graduates to apply the knowledge and skills to further their education or make a living through farming. Thus, the establishment of school farms in secondary schools has been an indispensable tool in the teaching of Agricultural Science and research. Sadly, secondary school farms are no longer there in most schools due to lack of land space and schools with sufficient land space seem to lack teachers

who possess sufficient skill in farm management practice needed to impart knowledge to students. Presently, many secondary schools do not bother to allocate land for this purpose and teachers are employed to teach agriculture science without due consideration of their capacity to implement farm practical in the school farm. The consequence of this is that students graduate without possessing farm practice skills expected of them. A focus group interaction with 10 teachers of Agricultural Science in secondary schools revealed that they do not possess sufficient farm practical skills on animal feed management and keeping of farm records for effective teaching of students in secondary school in Adamawa State.

Purpose of the Study

The main purpose of the study was to determine the farm practice improvement needs of teachers of Agricultural Science in operating school farm in Adamawa State. Specifically, the study sought to identify the:

1. farm management practice improvement needs of teachers of Agricultural Science in animal feed management for operating secondary school farms.
2. farm management practice improvement needs of teachers of Agricultural Science in farm record keeping for operating secondary school farms.

Research Questions:

1. What are the farm practice improvement needs of teachers of Agricultural Science in animal feed management for operating secondary school farm?
2. What are the farm practice improvement needs of teachers of Agricultural Science in farm record keeping for operating secondary school farms?

Hypothesis

HO_1: There is no significant difference between the mean response of teachers and agricultural extension agents on the farm practice improvement needs of teachers of Agricultural Science in animal feed management for operating secondary school farms.

METHODOLOGY

The study adopted descriptive survey research design. The population for the study was 1266 made up of 1173 teachers of Agricultural Science from 758 public Secondary Schools in five (5) educational zones in Adamawa State and 93 agricultural extension agents randomly selected from the four Zones of Adamawa. The sample for this study is 303 made up of 93 agricultural extension agents and 210 teachers of Agricultural Science which was determine using Taro Yamane formula. After which proportionate random sampling techniques was adopted to select the secondary school teachers. The instrument for data collection was a self-development questionnaire titled: Farm Practice Needs of Agricultural Science Teachers Questionnaire (FPINASTQ), which was designed in line with the research questions and hypotheses raised for the study. A rating scale of four points was used as response to questions. The options were: (HN highly needed=4; MN moderately needed=3; SN slightly needed=2; NN not needed and HP high performance-4; AP Average performance -3; LP Low performance-2; and NP no performance-1) for need and performance categories respectively. The reliability of the instrument was trial tested on 30 teachers of Agricultural Science and 11 extension agents in Adamawa State. Data collected from the trial testing were analyzed using Cronbach Apha reliability method which give a coefficient of 0.85 and 0.81 for need and performance respectively indicating that the instruments are reliable. The instrument was administered by the researcher with the help of (10) trained research assistant in the study area. Three hundred and three copies of questionnaire were administered to the respondents and was collected immediately. The data collected was analyzed using weighted mean and

Improvement Needed Index (INI) to answer research questions while t-test was used to test the research hypotheses at 0.05 level of significance. The needs performance was determined by calculating the mean (Xn) of the needed category for each item. The performance Gap (PG) was therefore determined by finding the difference between Xn and Xp for each item (PG=Xn-Xp). In a situation where the value of PG is positive (+ve), it means improvement is needed because the level at which secondary school teachers are performing is lower than what is expected. On the other hand, where PG is negative (-ve), it means improvement is not needed because secondary school teachers are performing more than what is required. And when PG is Zero (0), it means improvement is not needed because the level at which the secondary school teachers is equal to the level needed. Each item was assigned a (4) rating scale with a value of 4, 3,2 and 1 respectively and in testing the null hypotheses, if the P-value calculated is less than .05 level of significance, the null hypotheses will be rejected otherwise accepted.

RESULTS

The results are presented according to the research questions that guided the study.

Research Question 1

What are the farm practice improvement needs of teachers of Agricultural Science in animal feed management for operating secondary school farm?

Table 1: Farm Practice Improvement Needs of Teachers of Agricultural Science in Animal Feed Production Technique for Operating Secondary School Farms in Adamawa State, North East, Nigeria (N= 92, 200).

SN	ITEM STATEMENT	$\bar{X}_n$	$\bar{X}_p$	PG $(\bar{X}n - \bar{X}p)$	RMK
1	Nutrient requirements for livestock	3.52	3.48	0.04	IN
2	Ingredient sourcing for livestock feed	3.26	3.26	0.00	INN
3	Feed formulation	3.39	3.28	0.01	IN
4	Cost effective feed management	3.29	3.28	0.01	IN
5	Feed pelletization management	3.38	3.32	0.06	IN
6	Safety protocol for feed production	3.55	3.50	0.05	IN
7	Consider environmental impact on feed production	3.39	3.29	0.00	INN
8	Effective feed mill equipment operation, maintenance	3.55	3.41	0.14	IN
9	Mycotoxin management in animal feeds	3.45	3.37	0.08	IN
10	Qualitative feed production	3.42	3.34	0.08	IN
11	Feed analyses	3.47	3.41	0.06	IN
12	Storage and preservation of feeds	3.05	3.16	-0.11	INN
13	Record keeping for feed production	2.92	3.09	-0.17	INN
14	Alternative feed sources and substitute	1.75	1.87	-0.12	INN
15	Changes in feed based on livestock needs	3.55	3.49	0.06	IN
	Pooled	**3.26**	**3.23**	**0.03**	**IN**

Keys: Xn- mean of need category, Xp-mean of performance category, PG- performance gap, IN- improvement needed, INN- improvement not needed

Data presented in Table 1 shows that all the items except items 2,7 and 12-14 had their PG ranging from 0.01-0.14 and are positive. This means that the level at which the teachers perform in the items is lower that the level at which they are needed. This means that they need improvement in those items. But items 2,7 and 12-14 had negative PG. This means that the level at which the items are performed is higher or equal to the level they are needed, meaning that improvement is not needed in the items. The pooled performance gap of 0.03 implies that in all, teachers need farm practice improvement in animal feed production.

Hypothesis 1: There is no significant difference between the mean response of teachers and agricultural extension agents on the farm practice improvement needs of teachers of Agricultural Science in animal feed management for operating secondary school farms.

Table 2: t-Test Result of the Respondents on the Farm Practice Need of Agricultural Science Teachers in Animal Feed Production

STATUS	N	Mean	Std. Deviation	Std. Error Mean	Df	Sig	t-cal	Alpha value	Remark
Ext. Agents	92	3.265927	0.570666	.29183	290	.300	1.038	.05	NS
Teachers	200	3.239333	0.626251	.22340					

Keys: N= Number of respondents, Std = Standard deviation, df = degree of freedom, Sig. = P-value; t-cal = t-calculated value; NS = No Significant.

The result of the data presented in Table 2 shows that the p-value (sig) is 0.300 (at 290 degree of freedom) which is higher than the alpha value of 0.05. The null hypothesis is therefore accepted. This means that there is no significant difference between the mean response of agricultural extension agents and teachers on the farm practice need of Agricultural Science teachers in animal feed production.

Research Question 2

What are the farm practice improvement needs of teachers of Agricultural Science in farm record keeping for operating secondary school farms?

Table 3: Farm Practice Improvement Needs of Teachers of Agricultural Science in Record Keeping for Operating Secondary School Farms in Adamawa State, North East, Nigeria (N=92, 200).

SN	ITEM STATEMENT	$\bar{X}_n$	$\bar{X}_p$	PG $(\bar{X}n - \bar{X})$	RMK
1	Planning and recording crop sequences for soil health.	3.39	3.32	-0.07	INN
2	Maintaining records of pest and disease outbreaks	3.47	3.56	-0.09	INN
3	Recording irrigation schedules and water usage.	3.52	3.52	0.00	INN
4	Document fertilizer types, rates and application dates	3.41	3.34	0.07	IN
5	Keeping track of seed varieties, quantities and storage	3.40	3.38	0.02	IN
6	Keeping record of animal health vaccination and treatments.	3.55	3.52	0.03	IN
7	Recording feedstock quantities and usage for livestock	3.33	3.32	0.01	IN
8	Recording equipment maintenance and repair activities	3.45	3.44	0.01	IN
9	Collecting and analyzing wealth information for planning	3.41	3.45	-0.04	INN
10	Documenting crop yield, quality and harvest dates	3.40	3.43	-0.03	INN
11	Keeping track or expenses, income and employees	3.39	3.43	-0.04	INN
12	Recording labor hours and task for farm employees	3.40	3.44	-0.04	INN
13	Document strategies used for pest control	3.46	3.47	-0.01	INN
14	Tracking market trends and sales data for products	3.38	3.44	-0.06	INN
15	Regular review and analysis of Farms	3.32	3.38	-0.06	INN
	POOLED	**3.42**	**3.43**	**-0.01**	**INN**

Keys: Xn- mean of need category, Xp-mean of performance category, PG- performance gap, IN- improvement needed, INN- improvement not needed

Data presented in Table 3 shows that all the items except items 4-8 had their PG ranging from 0.00-0.09 and are negative. This means that the level at which the teachers perform in the items is equal to or higher than the level at which they are needed. This means that they do not need improvement in those items. But items 4-8 had their PG ranging from 0.01 to 0.07. This means that the level at which the items are performed is less than the level they are needed, meaning that improvement is needed in the items. The pooled performance gap of -0.01 implies that in all, teachers do not need farm practice improvement in record keeping.

Discussion of Findings

The findings of the study in research question 1 revealed that teachers need farm practice improvement in animal feed production. The finding is in line with Achi (2018) who found that teacher need skill improvement in 25 items in feed formulation and feeding of ruminant farm animals for effective instruction in the school farm. The author added that teachers of Agricultural Science in senior secondary school needed improvement in feeding and breeding as follows, 17 technical skills items in cattle production, 13 technical skills in pig production, 14 technical skills in poultry production and 11 technical skills in rabbit production. The finding also aligns with Hannington (2021) who identified lack of appropriate technical knowledge in feed formulation and processing, and poor feed handling and storage by teachers as a major challenge faced in farm practice in schools and further opined that there is need for partnership with farmers group or extension agents for retraining of the teachers in feed formulation. The findings of the study in hypothesis 1 agrees with Achi (2018) who found that there is no significant difference in the mean response of teachers and extension agents on the skill needs of agricultural teachers in animal feed production and animal feeding.

The findings of the study in research question 2 revealed that teachers do not need farm practice improvement in record keeping. The finding is in line with Yahaya (2017) who found from the study that teachers performed up to expectation in record keeping and thus do not require improvement rather, they require sustainability strategies to continue to perform up to expectation. However, the findings of the study disagree with Anon, (2021) who found from the study that teachers need competency in 18 items in farm recording. The finding further agrees with Patrick *et, al* (2019) who noted that agricultural science teachers hold the responsibility of educating students about the significance of farm records and thus need retraining in modern farm recording using technology.

CONCLUSION

Based on the findings of the study, it was concluded that teachers of Agricultural Science in secondary school need improvement in farm practice areas for operating the school farm.in animal feed production and record keeping.

RECOMMENDATIONS

Base on the findings of the study the researcher made the following recommendations:

1. Teachers should seek practical training on animal feed production from extension agents and livestock farmers in order for them to perform to expectation in animal feed production.

2. Agricultural science teachers should be given orientation on record keeping by the extension agents as it is essential for the success of any business.

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Administrative Quality Assurance and Teacher Evaluation as Determinants of Educational Quality Assurance in Public Secondary Schools in Abia State, Nigeria

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Abstract

The study investigated administrative quality assurance and teacher evaluation as determinants of educational quality in public secondary schools in Abia State, Nigeria. Two research questions and two null hypotheses guided the study. A correlational research design was adopted. The population comprised 8,528 respondents, including 248 principals and 8,280 teachers in 248 public secondary schools in Abia State. A multistage sampling procedure involving simple random technique was used to select 20 public secondary schools. One principal from each of the selected schools while nine teachers were randomly selected, giving a sample of 200 respondents (20 principals and 180 teachers). Data were collected using a researcher-developed instrument titled "Administrative Quality Assurance, Teacher Evaluation and Educational Quality Questionnaire (AQATEQQ)". The instrument was validated by three experts (two in Educational Management and one in Measurement and Evaluation). Reliability was established using Cronbach Alpha, yielding coefficients of 0.866, 0.867 and 0.923 for administrative quality assurance, teacher evaluation and educational quality respectively. Data were analyzed using Pearson Product Moment Correlation to answer the research questions, while linear regression was used to test the hypotheses at 0.05 level of significance. Findings revealed significant relationships between administrative quality assurance and educational quality in public secondary schools. The findings also revealed a significant relationship between teacher evaluation and educational quality in public secondary schools in Abia State. The study recommended strengthening administrative quality assurance practices and implementing regular teacher evaluation through effective appraisal systems and continuous professional development to enhance educational outcomes in public secondary schools in Abia State.

Keywords: Administrative Quality Assurance, Teacher Evaluation, Educational Quality, Public Secondary Schools.

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INTRODUCTION

Education is a foundation of national development and social transformation. It is a continuous process through which individuals acquire knowledge, skills, values, and attitudes necessary for personal growth and meaningful participation in the society. At the secondary school level, education occupies a particularly strategic position, as it serves as the bridge between basic and higher education while also preparing young people for responsible citizenship, employment, and lifelong learning. Ngene et al. (2024) posited that the main aim of secondary education in Nigeria today is to provide students with a comprehensive education, equipping them with the knowledge, skills, and competencies needed for academic and social success as they move on to higher academic or vocational pursuits, This is also in line with Edut et al.(2019) who stated that secondary schools are expected to prepare students for adulthood making sure that they are equipped while in school with skills to become productive workers and participate effectively in the society. Society expects secondary schools to

effectively develop students in cognitive, affective, and psychomotor areas. Public secondary schools play a critical role in shaping the future of students by equipping them with knowledge, skills, and values essential for contributing meaningfully to societal development (Gabriel et al.,2024). Secondary education is therefore expected to equip students with the intellectual, moral and practical competencies required to be efficient.

The attainment of these educational goals depends largely on the quality of teaching and the effectiveness of school administration. When teaching is properly delivered by the teachers and school activities are effectively coordinated, students are more likely to develop the knowledge, skills and character expected of them. Teachers play crucial roles in creating and delivering curricular content that is current, entertaining, and meet industry requirements (Anike, 2023). Adebimpe et al. (2026) also posited that teachers are the heart and most important human resource, since they are the building blocks and active agents that facilitate students' learning and ensure that students thrive academically to fulfil their potential and find meaningful careers. In other words, the quality of education provided in secondary schools is a reflection of the quality of instructional delivery and the efficiency of administrative processes within the school system. This underscores the need for deliberate mechanisms that ensure teachers perform their duties effectively and that school operations are consistently aligned with established educational standards.

One of the most important mechanisms for enhancing instructional effectiveness is teacher evaluation. Teacher evaluation can be said to be a process of assessing teachers' professional performance to determine how effectively they carry out their instructional responsibilities. It involves the continuous appraisal of teachers' classroom practices, lesson delivery, subject mastery, classroom management, use of instructional materials, adherence to curriculum guidelines, and overall contribution to students' learning outcomes. Adebimpe et al, (2026) stated that teachers are likely to use any teaching method that seems easy to them and some probably adopt any lecture method without considering its suitability to the topic, age, ability or class of the students. Through regular supervision, observation and assessment, teacher evaluation helps to ensure that teachers employ appropriate teaching methods, maintain professional standards and meet the expectations of the educational system. If teachers are not well supervised, effectiveness in instruction would be adversely affected and the instructional delivery purposes may not be well realized (Acha & Unuigbe 2025). This means that for the goal of teaching and learning process to be actualized, teachers' needs to be regurlarly supervised.

According to da Silva Carvalho et al. (2021), teacher evaluation has been identified as a viable mechanism for pinpointing both strengths and weaknesses in teaching, as well as for offering customized assistance to teachers in order to enhance their instructional methods. Teacher evaluation is therefore of utmost importance because it promotes accountability, professional growth, and instructional improvement. It provides feedback that helps teachers identify their strengths and areas requiring improvement. It also enables school administrators and educational authorities to determine whether teachers are effectively implementing the curriculum and utilizing appropriate pedagogical strategies. Without a functional evaluation system, it becomes difficult to ascertain whether teachers are performing in line with professional expectations. In such circumstances, instructional quality may decline, thereby affecting students' academic achievement, motivation, and overall development. Effective teacher evaluation therefore serves as a critical tool for improving classroom instruction and enhancing educational outcomes.

Beyond teacher evaluation, the quality of education in secondary schools is also influenced by the effectiveness of administrative quality control. According to Onyekwelu,

(2024), quality can be broadly defined as the degree to which a product, service, process, or system meets or exceeds established standards, regulations, or expectations, thereby fulfilling the needs and desires of its stakeholders. Campbell and Rozsnyai (2022) opined that quality assurance is an all-embracing effect whereby all policies and actions through which quality of education is developed and maintained. Administrative quality assurance refers to the processes, policies, and supervisory practices put in place by school administrators to ensure that educational activities conform to prescribed standards and objectives. It involves planning, monitoring, coordinating, evaluating, and improving school operations in order to achieve educational excellence. In the school setting, the principal plays a central role in administrative quality control, serving as the chief instructional leader and administrative head. Quality assurance involves meeting standards in resource usage and management ensuring that the output meets expectations (Obona et al.,2021).

The principal as the direct link between the school and educational authorities is responsible for ensuring compliance with government policies, curriculum standards, and institutional regulations. Similarly, Onwubuya (2017) defined principals as leaders who also serve as a liaison between the school and the wider community. Peretomode in Aigboje (2024) posited that for teachers to perform their teaching duties effectively, the principals must always supervise teachers' regularly to promote effective instructional delivery in schools. Shuaibu (2016) found that supervision is crucial for achieving organizational goals and maintaining educational standards. Supervision is needed in education to ensure uniformity and effectiveness in teaching and serves as a tool to promote teaching and learning in schools. Principals supervise teachers, monitor students' academic progress, maintain discipline, coordinate school resources, and create an enabling environment for effective teaching and learning. They also identify areas of need within the school and communicate such needs to relevant educational authorities for necessary intervention. Through these responsibilities, principals function as the eyes and ears of educational management boards and ministries of education, ensuring that quality standards are maintained at the school level.

The combined influence of teacher evaluation and administrative quality assurance cannot be overemphasized. While teacher evaluation focuses on improving instructional practices and teacher effectiveness, administrative quality assurance ensures that the broader school environment supports the delivery of quality education. Together, they provide a framework for accountability, continuous improvement, and educational excellence. When talking about the effects of teacher quality on Students' performance, recent research emphasizes that a teacher's contribution to student performance depends on many variables, such as the teacher's educational background, classroom management and years of experience (Ambusaidi &Yang 2019). When teachers are regularly evaluated and administrators effectively monitor school operations, the likelihood of achieving high standards is significantly enhanced.

However, there are indications that the quality of education in many secondary schools in Nigeria remains inadequate. Evidence of this is often seen in declining student engagement, inadequate mastery of learning outcomes, poor study habits, examination malpractices, and the inability of some graduates to demonstrate the expected competencies and skills. These challenges may be linked to weaknesses in teacher supervision, inconsistent evaluation practices, and lapses in administrative oversight. Where teachers are not adequately monitored and school administration is ineffective, the quality of instructional delivery and students' learning experiences may be compromised. It is against this background that this study seeks to examine administrative quality control and teacher evaluation as determinants of educational quality in secondary schools in Nigeria. Specifically, the study aims to determine the extent to

which effective teacher evaluation and administrative quality assurance contribute to the improvement of educational quality. The findings of this study are expected to provide valuable insights for educational administrators, policymakers, and other stakeholders committed to enhancing the standard of secondary education in Nigeria.

Statement of the problem

Education is expected to promote national development through the provision of quality teaching and learning experiences capable of producing competent and responsible individuals. At the secondary school level, the attainment of educational quality depends largely on effective school administration, proper monitoring of instructional activities and continuous evaluation of teachers to ensure that educational standards are maintained. Administrative quality assurance and teacher evaluation are therefore essential mechanisms for improving instructional effectiveness and achieving educational objectives in schools.

However, the researcher has observed that the expected level of educational quality in many public secondary schools in Abia State might not have been fully achieved. Issues such as ineffective instructional delivery, poor supervision of teachers, declining commitment to duty, irregular teacher assessment, and poor academic outcomes among students appear to persist in some schools. These persistent challenges suggest weaknesses in administrative quality control and teacher evaluation mechanisms thereby necessitating an empirical investigation into their influence on educational quality in secondary schools. Despite reforms in the education sector, deficiencies in administrative practices and teacher evaluation mechanisms continue to be observed within schools. This situation raises questions about the extent to which administrative quality assurance and teacher evaluation contribute to educational quality in secondary schools in Abia State. Furthermore, while several studies have examined quality assurance and school effectiveness in different contexts, limited studies appear to have focused specifically on administrative quality control and teacher evaluation as determinants of educational quality in secondary schools in Abia State. It is against this background that this study sought to investigate administrative quality assurance and teacher evaluation as determinants of educational quality in secondary schools in Abia State.

Research questions

The following research questions guided the study:

1. What is the relationship between administrative quality assurance and educational quality in public secondary schools in Abia State?
2. What is the relationship between teacher evaluation and educational quality in public secondary schools in Abia State?

Hypotheses

The following null hypotheses were tested at a 0.05 level of significance:

$H0_1$: There is no significant relationship between administrative quality assurance and educational quality in secondary schools in Abia State.

$H0_2$: There is no significant relationship between teacher evaluation and educational quality in secondary schools in Abia State.

METHODOLOGY

The study adopted a correlational survey research design. The design was considered appropriate because it permits the examination of the relationship among variables without manipulating them. Nworgu (2015) posited that correlational research design measures two or more variables to determine the extent to which they relate or change in an identifiable pattern and it's appropriate for variables that do not readily lend themselves for experimental manipulation. The design was therefore considered appropriate for examining the relationship among administrative quality assurance, teacher evaluation and educational quality in public secondary schools in Abia State. The area of the study was Abia State, Nigeria. The population of the study comprised 8,528 respondents made up of 248 principals and 8,280 teachers in 248 public secondary schools in Abia State. A multistage sampling procedure was adopted for the study. Firstly, stratified sampling technique was used to group schools according to educational zones in the state to ensure adequate representation of all zones. Thereafter, simple random sampling technique was used to select 20 public secondary schools from the strata. One principal from each selected school was included in the study due to their administrative role in the selected schools while nine teachers were randomly selected from each school. This gave a total sample size of 200 respondents comprising 20 principals and 180 teachers. The instrument for data collection was a structured questionnaire developed by the researcher titled Administrative Quality Assurance, Teacher Evaluation and Educational Quality Questionnaire (AQATEQQ). The questionnaire was structured on a four-point rating scale and divided into sections based on the variables of the study. The instrument was validated by three experts, two from the Department of Educational Management and one from the Department of Measurement and Evaluation. The reliability of the instrument was established using Cronbach Alpha reliability method to determine the internal consistency of the instrument. The researcher with the assistance of briefed research assistants administered the questionnaire directly to the respondents. Data collected was analyzed using Pearson Product Moment Correlation to answer the research questions and linear regression to test the null hypotheses at 0.05 level of significance.

RESULTS

Research question 1

What is the relationship between administrative quality assurance and educational quality in public secondary schools in Abia State?

Table 1: Pearson Product moment correlation between administrative quality assurance and educational quality in public secondary schools in Abia State

Variables	N	R	Remark
Administrative quality assurance Educational quality	200	.659	Very strong positive relationship

The result in Table 1 reveals that r-value is .659. This implied that there is a very strong positive relationship between teachers' administrative quality assurance and educational quality in public secondary schools in Abia State. In other words, improvement in administrative quality assurance is associated with improvement in educational quality in schools studied. The r-value of 0.659 indicates that effective administrative quality assurance practices contribute significantly to enhancing educational quality.

Hypothesis 1

There is no significant relationship between administrative quality assurance and educational quality in secondary schools in Abia State.

Table 2: Result of linear regression between administrative quality assurance and educational quality in public secondary schools in Abia State

Model	Sum of squares	Df	Mean square	F	Sig
Regression	49.461	1	49.461	151.936	.000[b]
Residue	64.456	198	.326		
Total	113.917	199			

$R^{2=}$ 0.434

In Table 2, the result of the regression analysis revealed that the relationship between administrative quality assurance and educational quality in public secondary schools in Abia State was statistically significant. The coefficient of determination (R^2) of 0.443 indicates that 44.3% of the variation in quality education in public secondary schools in Abia State could be accounted for by administrative quality assurance, while the remaining 56.6% could be attributed to other factors outside the study. Therefore, the null hypothesis was rejected.

Research question 2

What is the relationship between teacher evaluation and educational quality in public secondary schools in Abia State?

Table 3: Result of linear regression between teacher evaluation and educational quality in public secondary schools in Abia State

Variables	N	R	Remark
Teachers' Evaluation	200	.787	Very strong positive relationship
Educational quality			

The result in Table 3 reveals that R-value is .787. This implies that there is a very strong positive relationship between teachers' evaluation and educational quality in public secondary schools in Abia State. This indicates that effective and regular evaluation of teachers is associated with improved educational quality in public secondary schools in Abia State. The high r- value further suggests that teachers' evaluation plays an important role in promoting effective teaching, accountability and overall educational improvement in public secondary schools. The coefficient of determination (R^2) of 0.519 indicates that 51.9% of the variation in quality education in public secondary schools in Abia State could be accounted for by quality control while the remaining 48.1% could be attributed to other factors outside the study.

Hypothesis 2

There is no significant relationship between teachers' evaluation and educational quality in secondary schools in Abia State.

Table 4: Result of linear regression between teachers' evaluation and educational quality in public secondary schools in Abia State

Model	Sum of squares	Df	Mean square	F	Sig
Regression	70.568	1	70.568	151.936	.000[b]
Residue	43.349	198	.219		
Total	113.917	199			

$R^2 = 0.619$

In Table 4, the result of the regression analysis revealed that the relationship between teacher education and educational quality in public secondary schools in Abia State was statistically significant. The coefficient of determination (R^2) of 0.519 indicated that 51.9% of the variation in quality education in public secondary schools in Abia State could be accounted for by teacher evaluation, while the remaining 48.1% could be attributed to other variables not included in the study. Therefore, the null hypothesis was rejected.

Discussion of findings

The findings of this study revealed that there is a very strong positive relationship between administrative quality assurance and educational quality in public secondary schools in Abia State. The result showed an r-value of 0.659, indicating that improvement in administrative quality assurance is associated with improvement in educational quality. This finding implies that effective administrative practices such as supervision, monitoring of instructional activities, maintenance of standards, provision of instructional materials, and proper coordination of school activities contribute significantly to the achievement of quality education in secondary schools. The finding agrees with Ngene et al. (2024) who found that quality assurance indicators significantly predicted principals' administrative effectiveness in Abia State. Administrative quality assurance serves as an important mechanism for ensuring that educational objectives are achieved effectively. Through adequate supervision and monitoring, school administrators are able to identify lapses in teaching and learning processes and provide corrective measures that enhance educational outcomes. The findings further suggests that when school administrators maintain proper quality assurance measures, they promote a more coordinated and efficient school system thereby enhancing their administrative effectiveness and contributing to improved educational outcomes.

The study also found that there is a very strong positive relationship between teachers' evaluation and educational quality in public secondary schools in Abia State. The result revealed an r-value of 0.787, which indicates that effective teachers' evaluation is closely associated with improved educational quality. This findings implies that regular assessment and evaluation of teachers' performance contribute greatly to effective teaching, accountability, professional improvement and better educational outcomes in schools, this is in line with Edo et al. (2019) who found that the supervision of teachers through a variety of techniques serves as a veritable means of improving teachers' performance and that classroom visitation and demonstration as supervision strategies contribute to teachers' job performance.

Overall, the findings of this study established that both administrative quality assurance and teachers' evaluation are important determinants of educational quality in public secondary schools in Abia State. The study therefore emphasizes the need for school administrators and educational stakeholders to strengthen quality assurance practices and teacher evaluation mechanisms in order to improve the standard of education in secondary schools.

CONCLUSION

Based on the findings of the study, it was concluded that administrative quality assurance and teachers' evaluation have significant positive relationships with educational quality in public secondary schools in Abia State. The findings imply that educational quality in public secondary schools is influenced by the effectiveness of administrative quality assurance practices and teacher evaluation. This suggests that schools that prioritize proper supervision, monitoring and adherence to established standards are more likely to achieve improved educational outcomes. The findings further imply that regular evaluation of teachers' performance promotes accountability, professional growth and effective instructional delivery which are essential for sustaining quality education in secondary schools.

RECOMMENDATIONS

1. School administrators and educational authorities should strengthen administrative quality assurance practices through regular supervision, monitoring and provision of adequate instructional resources in order to improve educational quality in public secondary schools in Abia State.
2. Teachers should be regularly evaluated by their principals and heads of departments through effective performance appraisal mechanisms and professional development programmes to enhance teaching effectiveness and improve educational outcomes in secondary schools in Abia State.

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Motivational Needs of Indigenous Capture Fish Farmers for Increased Protein Production in Bayelsa State, Nigeria

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Abstract

The study investigated the motivational needs of indigenous capture fish farmers for increased protein production in Bayelsa State, Nigeria. The study was guided by four specific objectives and four research questions. It adopted the analytic descriptive survey research design. The targeted population of the study was all educated capture fish farmers in Bayelsa State. The purposive sampling technique was used to select a sample size of 267 respondents. The instrument for data collection contained 20 item statements, titled "Motivational Needs of Indigenous Capture Fish Farmers for Increased Protein Production Questionnaire", which was used to elicit information from the respondents. It was validated by two experts, one from the Test and Measurement unit of the Department of Counselling and Educational Psychology and one from the Department of Agricultural Science Education, Faculty of Education, Niger Delta University, Wilberforce Island, Bayelsa State. To ascertain the reliability of the instrument, the Pearson Product Moment Correlation Coefficient statistical tool was used and a reliability index of 0.72 was yielded, indicating a good reliability. The data collected were analyzed using mean statistics and standard deviation. The study found that that access to affordable and modern fishing equipment will motivate indigenous capture fish farmers for increased protein production in Bayelsa State. The study therefore concluded and recommended that access to affordable and modern fishing equipment significantly motivates indigenous capture fish farmers to enhance their fishing efforts for increased protein production. As such, the Government of Bayelsa State should provide indigenous capture fish farmers with affordable and modern fishing equipment to enhance their efficiency and motivation, ensuring increased protein production.

Keywords: Capture, Fish Farmers, Increased Protein Production, Indigenous, Motivational Needs.

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INTRODUCTION

Agricultural development in coastal societies continues to rely heavily on small-scale, community-embedded fisheries, where motivation plays a critical role in sustaining productivity and livelihoods. Motivation shapes the willingness of fishers to invest effort, adopt innovations, and engage in sustainable practices, particularly in traditional contexts where livelihood decisions are deeply rooted in cultural norms and socio-economic realities (Ainley, Berkes & McConney, 2023; Boateng, 2021). In Bayelsa State, where fishing remains a major source of food and employment, understanding the drivers of motivation in local fishing communities is vital for strengthening fish supply and, ultimately, enhancing nutritional outcomes, thereby creating a logical entry point for examining how motivation influences the actions of fishers.

The indigenous character of fishing communities in the Niger Delta reflects generational knowledge, customary practices, and cultural ties to aquatic ecosystems, which influence how fishers interpret opportunities, constraints, and livelihood choices. Indigenous populations often exhibit strong adaptive strategies derived from local ecological knowledge, yet their participation in development initiatives is frequently constrained by socio-economic

marginalisation and limited institutional support (Gómez-Merino & Trejo-Téllez, 2023; Ofoegbu, 2022). These realities underscore how cultural identity shapes fishing practices and productivity, which naturally leads to an exploration of the specific livelihoods of indigenous capture fish farmers.

Capture fish farmers in coastal communities depend directly on natural water bodies, undertaking labour-intensive fishing activities that demand skill, endurance, and substantial risk-taking, with productivity often influenced by environmental variability and resource depletion. The effectiveness of capture-based fisheries is closely linked to fishers' motivation to embrace improved methods, optimise harvests, and engage in responsible fishing practices even amid fluctuating ecological conditions (Kumah & Aniah, 2022; Tilley, Wilkinson & Mills, 2022). Since the livelihood outcomes of capture fish farmers determine the volume and quality of fish available for consumption, this discussion flows into the broader relevance of indigenous capture fish farmers within Bayelsa State's food system, particularly in relation to their contribution to household nutrition, food security, and the supply of fish as a major source of dietary protein.

Indigenous capture fish farmers constitute a key component of local food security architecture, providing a substantial share of the animal protein consumed in rural and peri-urban communities. Their contribution is significant because fish remains one of the most economically accessible and culturally preferred protein sources across the Niger Delta, yet their productivity depends on conditions that sustain motivation and enable innovation (Onyango Mutinda, & Ochieng, 2021; Ugochukwu & Ibe, 2023). Their strategic role in meeting dietary needs reinforces the need to examine protein concerns that affect public health in the region.

Protein remains an essential nutrient for growth, immunity, and general well-being, and fish provides a high-quality protein source with minimal cost compared to livestock. In Nigeria, however, inadequate protein intake persists as a public health concern, with fish playing a vital role in closing the nutritional gap, particularly among low-income households (FAO, 2022; Okpara, Sampson & Ebiere, 2023). The importance of fish protein in rural diets provides a strong link to the discourse on protein production.

Increasing protein production is essential for addressing nutritional deficiencies, especially in regions where other animal protein sources are economically inaccessible. Enhancing the volume of fish protein available to consumers requires improving fishing outcomes, strengthening market systems, and promoting supportive policies that increase fishers' productivity (Eyo & Effiong, 2021; Usman & Emmanuel, 2023). Since productivity relies partly on access to necessary inputs, it becomes important to consider how equipment access shapes fishers' motivation and efficiency.

Access to affordable and modern fishing equipment significantly enhances fishing efficiency, reduces labour demands, and increases safety, all of which contribute to higher yields and better market-quality fish, by enabling fishers to harvest more fish, minimise post-harvest losses, and maintain the freshness and quality of their catch for sale and consumption. Studies have shown that modern gear such as improved nets, durable boats, and efficient preservation tools encourages fishers to increase effort and adopt practices that improve catch quality (Ayanlade & Oni, 2022; Sarpong & Bannerman, 2023). These insights naturally link to incentives such as financial assistance, which often determines whether such equipment can be acquired.

Low-interest credit schemes, (Food and Agriculture Organization [FAO], 2024) provide vital financial leverage for small-scale fishers, enabling them to purchase improved gear, invest

in safer boats, and adopt preservation technologies that reduce post-harvest losses. Access to credit not only increases productivity but also strengthens fishers' confidence and motivation to remain in the occupation despite livelihood uncertainties (Udoh & Okoro, 2022; Mensah, Armah & Danso, 2023). However, sustained productivity is also influenced by the quality and stability of aquatic ecosystems, which shape fish availability and fishing success rates.

Improving environmental conditions in fishing communities such as reducing pollution, managing water hyacinth invasions, and protecting breeding grounds has been shown to enhance fish availability and reduce the stress associated with fishing activities. Healthy aquatic environments support natural regeneration of fish stocks, thereby motivating fishers to sustain effort and invest in productivity-enhancing innovations (Scheren, Ekpenyong & Abah, 2021; Abah & Nwankwo, 2023). Environmental improvements must also be supported by broader safety systems, which create a stable setting for fishing activities.

Ensuring safe and secure fishing environments by government authorities, community-based organisations and local fishing associations and fishers themselves is central to sustaining fisher motivation, given the increasing threats of piracy, boat accidents, and climate-related hazards in coastal Nigeria. Safety provisions such as surveillance, patrols, and designated safe zones promote confidence among fishers, allowing them to work longer hours and explore productive fishing grounds without fear (Adewumi & Olaleye, 2022; Eke, Ibizugbe & Wali, 2023). Despite the importance of these motivational and structural conditions, evidence suggests persistent challenges that constrain indigenous fishers' productivity in Bayelsa State, giving rise to the need for this study.

In many fishing communities across Bayelsa State, fishers continue to struggle with inadequate motivation due to limited access to modern equipment, insufficient credit support, unsafe fishing environments, and deteriorating ecological conditions, all of which undermine fish availability and protein sufficiency. Yet, empirical research exploring the motivational needs of indigenous capture fish farmers in relation to protein production remains scarce, creating both a conceptual and contextual gap in fisheries development literature.

Therefore, it is against this backdrop that this study investigated the motivational needs of indigenous capture fish farmers for increased protein production in Bayelsa State, Nigeria. Specifically, the study sought to investigate how;

1. access to affordable and modern fishing equipment will motivate indigenous capture fish farmers for increased protein production in Bayelsa State;
2. provision of low-interest credit schemes will motivate indigenous capture fish farmers for increased protein production in Bayelsa State;
3. improvement of environmental conditions in fishing communities will motivate indigenous capture fish farmers for increased protein production in Bayelsa State; and
4. ensuring safe and secure fishing environments will motivates indigenous capture fish farmers for increased protein production in Bayelsa State.

Research Questions

1. How will access to affordable and modern fishing equipment motivate indigenous capture fish farmers for increased protein production in Bayelsa State?
2. How will provision of low-interest credit schemes motivate indigenous capture fish farmers for increased protein production in Bayelsa State?
3. How will improvement of environmental conditions in fishing communities motivate indigenous capture fish farmers for increased protein production in Bayelsa State?

4. How will ensuring safe and secure fishing environments motivates indigenous capture fish farmers for increased protein production in Bayelsa State?

METHODOLOGY

The study area was Bayelsa State and it adopted descriptive survey research design. The targeted population of the study was all 377 registered fish farmers across the eight Local Government Areas of Bayelsa State, drawn from official agricultural listings (Ministry of Agriculture and Natural Resources, Bayelsa State, 2024). A sample size of 267 respondents was purposively selected for study. Hence, the sampling technique adopted for the study was the purposive sampling technique. The instrument for data collection contained 20 item statements, titled "Motivational Needs of Indigenous Capture Fish Farmers for Increased Protein Production Questionnaire", which was used to elicit information from the respondents. It was structured into a four-point scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD), with corresponding values of 4, 3, 2, and 1, respectively. It was validated by two experts, one from the Test and Measurement unit of the Department of Counselling and Educational Psychology and one from the Department of Agricultural Science Education, Faculty of Education, Niger Delta University, Wilberforce Island, Bayelsa State. To ascertain the reliability of the instrument, the Pearson Product Moment Correlation Coefficient statistical tool was used and a reliability index of 0.72 was yielded, indicating a good reliability. The instrument was administered to the respondents by the researcher and three trained research assistants and was retrieved immediately the respondents responded. For the analysis, the research questions were analyzed using mean and standard deviation. For a decision to be reached, items with mean scores equal or greater 2.50 were said to be agree. While, items with mean scores equal to or less than 2.49 were said to be disagree.

RESULTS

Research Question One

How will access to affordable and modern fishing equipment motivate indigenous capture fish farmers for increased protein production in Bayelsa State?

Table 1: Mean and Standard Deviation Analysis of How Access to Affordable and Modern Fishing Equipment in Fishing Communities Will Motivate Indigenous Capture Fish Farmers for Increased Protein Production in Bayelsa State

	Item Statements	$\bar{x}$	SD	Decision
1	Access to affordable fishing equipment will motivate indigenous capture fish farmers to increase their fishing effort.	3.09	0.92	A
2	Access to modern fishing equipment will motivate indigenous capture fish farmers to improve their daily fishing efficiency.	3.05	0.96	A
3	Provision of adequate fishing gear will motivate indigenous capture fish farmers to adopt improved fishing practices for higher protein output.	3.03	0.94	A
4	Accessible fishing tools will motivate indigenous capture fish farmers to work more confidently toward higher catch levels.	3.14	0.89	A

5	Modernised fishing equipment will motivate indigenous capture fish farmers to sustain increased protein production.	3.10	0.92	A
	Grand $\bar{x}$ and SD	**3.08**	**0.93**	**A**

Key: $\bar{x}$ = Mean and SD = Standard Deviation

The data presented in Table 1 revealed the mean and standard deviation scores of how access to affordable and modern fishing equipment will motivate indigenous capture fish farmers for increased protein production in Bayelsa State. The data revealed that all the items had their mean scores ranged from 3.03 to 3.14 with their standard deviation from 0.89 to 0.96. However, based on the fact that the Grand Mean of 3.08 is greater than the criterion mean score of 2.50; this therefore implies that respondents agreed that access to affordable and modern fishing equipment will motivate indigenous capture fish farmers for increased protein production in Bayelsa State. Relatively, the Grand Standard Deviation of 0.93 indicated that the respondents have similar opinions on how access to affordable and modern fishing equipment will motivate indigenous capture fish farmers for increased protein production in Bayelsa State.

Research Question Two

How will provision of low-interest credit schemes motivate indigenous capture fish farmers for increased protein production in Bayelsa State?

Table 2: Mean and Standard Deviation Analysis of How Provision of Low-Interest Credit Schemes in Fishing Communities Will Motivate Indigenous Capture Fish Farmers for Increased Protein Production in Bayelsa State

	Item Statements	$\bar{x}$	SD	Decision
1	Low-interest credit will motivate indigenous capture fish farmers to acquire essential fishing inputs.	3.05	0.96	A
2	Affordable credit schemes will motivate indigenous capture fish farmers to expand their fishing operations.	3.03	0.93	A
3	Financial support will motivate indigenous capture fish farmers to invest in productivity-enhancing technologies.	3.04	0.93	A
4	Access to soft loans will motivate indigenous capture fish farmers to maintain steady levels of production.	3.14	0.87	A
5	Low-interest credit will motivate indigenous capture fish farmers to work toward increased protein production.	3.09	0.87	A
	Grand $\bar{x}$ and SD	**3.07**	**0.91**	**A**

Key: $\bar{x}$ = Mean and SD = Standard Deviation

The data presented in Table 2 revealed the mean and standard deviation scores of how provision of low-interest credit schemes will motivate indigenous capture fish farmers for increased protein production in Bayelsa State. The data revealed that all the items had their mean scores ranged from 3.03 to 3.14 with their standard deviation from 0.87 to 0.96. However, based on the fact that the Grand Mean of 3.07 is greater than the criterion mean score of 2.50; this therefore implies that respondents agreed that provision of low-interest credit schemes will motivate indigenous capture fish farmers for increased protein production in Bayelsa State.

Relatively, the Grand Standard Deviation of 0.91 indicated that the respondents have similar opinions on how provision of low-interest credit schemes will motivate indigenous capture fish farmers for increased protein production in Bayelsa State.

Research Question Three

How will improvement of environmental conditions in fishing communities motivate indigenous capture fish farmers for increased protein production in Bayelsa State?

Table 3: Mean and Standard Deviation Analysis of How Improvement of Environmental Conditions in Fishing Communities Will Motivate Indigenous Capture Fish Farmers for Increased Protein Production in Bayelsa State

	Item Statements	$\bar{x}$	SD	Decision
1	Improved environmental conditions will motivate indigenous capture fish farmers to participate actively in fishing.	2.97	0.98	A
2	Clean aquatic environments will motivate indigenous capture fish farmers to sustain their fishing engagements.	3.04	0.88	A
3	Healthy water bodies will motivate indigenous capture fish farmers to increase fishing for higher protein supply.	3.12	0.85	A
4	Reduced environmental constraints will motivate indigenous capture fish farmers to remain consistent in fishing.	3.04	0.87	A
5	Favourable ecological conditions will motivate indigenous capture fish farmers to pursue increased protein production.	3.04	0.93	A
	Grand x̄ and SD	**3.04**	**0.90**	**A**

Key: $\bar{x}$ = Mean and SD = Standard Deviation

The data presented in Table 3 revealed the mean and standard deviation scores of how will improvement of environmental conditions in fishing communities motivate indigenous capture fish farmers for increased protein production in Bayelsa State. The data revealed that all the items had their mean scores ranged from 2.97 to 3.12 with their standard deviation from 0.85 to 0.98. However, based on the fact that the Grand Mean of 3.04 is greater than the criterion mean score of 2.50; this therefore implies that respondents agreed that improvement of environmental conditions in fishing communities will motivate indigenous capture fish farmers for increased protein production in Bayelsa State. Relatively, the Grand Standard Deviation of 0.90 indicated that the respondents have similar opinions on how improvement of environmental conditions in fishing communities will motivate indigenous capture fish farmers for increased protein production in Bayelsa State.

Research Question Four: How will ensuring safe and secure fishing environments motivates indigenous capture fish farmers for increased protein production in Bayelsa State?

Table 4: Mean and Standard Deviation Analysis of How Ensuring Safe and Secure Fishing Environments Will Motivate Indigenous Capture Fish Farmers for Increased Protein Production in Bayelsa State

	Item Statements	$\bar{x}$	SD	Decision
1	Safe fishing environments will motivate indigenous capture fish farmers to remain committed to daily fishing activities.	3.04	0.88	A
2	Community-level security will motivate indigenous capture fish farmers to explore more productive fishing grounds.	3.11	0.93	A
3	Reduced fishing-related risks will motivate indigenous capture fish farmers to intensify their fishing effort.	3.12	0.85	A
4	Safe fishing zones will motivate indigenous capture fish farmers to operate confidently in their fishing routines.	3.13	0.92	A
5	Secure fishing environments will motivate indigenous capture fish farmers to increase protein production.	3.11	0.87	A
	Grand $\bar{x}$ and SD	**3.10**	**0.89**	**A**

Key: $\bar{x}$ ***= Mean and SD = Standard Deviation***

The data presented in Table 4 revealed the mean and standard deviation scores of how ensuring safe and secure fishing environments will motivate indigenous capture fish farmers for increased protein production in Bayelsa State. The data revealed that all the items had their mean scores ranged from 3.04 to 3.13 with their standard deviation from 0.87 to 0.93. However, based on the fact that the Grand Mean of 3.10 is greater than the criterion mean score of 2.50; this therefore implies that respondents agreed that ensuring safe and secure fishing environments will motivate indigenous capture fish farmers for increased protein production in Bayelsa State. Relatively, the Grand Standard Deviation of 0.89 indicated that the respondents have similar opinions on how ensuring safe and secure fishing environments will motivate indigenous capture fish farmers for increased protein production in Bayelsa State.

Discussion of Findings

The study found in Table 1, that access to affordable and modern fishing equipment will motivate indigenous capture fish farmers for increased protein production in Bayelsa State. This aligns with a broader body of evidence indicating that enabling fishers to utilise improved technologies enhances productivity, resilience, and supply stability. This position is reinforced by studies showing that modern fishing inputs significantly influence catch efficiency, income diversification and the overall sustainability of small-scale fisheries (Tilley, Wilkinson & Mills, 2022). The consistency across these findings highlights that equipment-related empowerment remains central to strengthening local fisheries and improving food and nutrition security.

One study that supports this finding demonstrates that the availability of efficient fishing gear and vessels substantially improves the volume and quality of fish landed by artisanal fishers, particularly in coastal communities where livelihoods depend on nearshore fisheries (Obuaku-Igwe & Ibeawuchi, 2021). These authors observed that when fishers have reliable

tools such as motorised boats, durable nets, and storage facilities, their catch rate increases, leading to more stable fish supplies for household consumption and local markets. This corroborates the present finding, as indigenous fishers in Bayelsa State similarly rely on equipment availability to enhance their capacity to produce protein-rich fish for community needs.

A second supporting finding reveals that access to modern fishing technologies also strengthens fishers' adaptive capacity, enabling them to overcome environmental challenges such as fluctuating water conditions and declining fish stocks (Akanni, Musa &Adeoye, 2023). The study emphasised that fishers equipped with improved gear are better positioned to explore wider fishing grounds, reduce post-harvest losses, and maintain consistent production. This evidence reinforces the idea that modern equipment is not merely beneficial but essential for indigenous fishers seeking to sustain production levels in dynamic ecological settings like the Niger Delta.

A third corroborating finding shows that mechanisation and technological enhancement in small-scale fisheries directly promote economic empowerment, which in turn motivates farmers to intensify production (Okafor, Eze & Uwadiegwu, 2020). The authors reported that affordable tools lower operational barriers, reduce labour intensity, and encourage fishers to engage more frequently in fishing activities. Their conclusion echoes the present study's finding, demonstrating that when indigenous capture fish farmers can access modern equipment at reasonable costs, they are more committed to increasing their catch volumes, thereby contributing to the availability of animal protein across communities in Bayelsa State.

In Table 2, it found that provision of low-interest credit schemes will motivate indigenous capture fish farmers for increased protein production in Bayelsa State. This finding is supported by several empirical and conceptual findings. First, a recent study focused on fishers in Bayelsa State demonstrated that limited access to formal credit constrains technology adoption in the fishery sub-sector. The authors concluded that inadequate credit allocation "hindered progress in the fishing industry," thereby limiting the ability of fishers to upgrade gear or expand operations (Eli & Solomon, 2023). This suggests that if low-interest credit schemes were provided, fishers would likely be more motivated to invest in productive assets and consequently increase protein production.

Second, evidence from smallholder agriculture more broadly shows that credit access improves productivity and resource investment. For instance, a propensity-score matching study found that smallholder farmers who obtained credit experienced significant gains in crop productivity and annual income compared to non-users (Abedin, Nikolov & Malek, 2020). Although that study was not conducted among fishers, the logic is analogous: with credit relaxing financial constraints, rural producers, including artisanal fishers gain capacity to invest in better inputs and technologies, which enhances output, including fish for protein supply.

Third, in fisheries-specific studies, access to credit has been linked with improved technical and allocative efficiency, especially among motorised or semi-mechanised small-scale fishers. In one study, credit was identified as a key determinant of catch levels and overall technical efficiency, alongside labour and adequate storage facilities (Smith, Jones & Williams, 2010). That study observed higher catch levels among fishers who had access to credit, which supports the idea that formal financial support motivates increased fishing effort and better yields, thus contributing to greater protein output.

Together, these results reinforce the assertion that low-interest credit schemes can function as a strong motivational lever for indigenous capture fish farmers by removing financial barriers to productive investment. By enabling access to capital for improved gear,

fuel, or storage facilities, such credit stimulates greater fishing effort and efficiency, outcomes which are essential for boosting fish production and improving availability of protein for communities.

Also, in Table 3, it found that improvement of environmental conditions in fishing communities will motivate indigenous capture fish farmers for increased protein production in Bayelsa State. This aligns strongly with contemporary research emphasising that the state of the aquatic environment remains a primary determinant of artisanal fishers' productivity and willingness to intensify fishing efforts. Studies across coastal and riverine communities have consistently shown that favourable environmental conditions such as clean water bodies, reduced pollution, and restored habitats directly influence fish stock availability and fisher motivation (Tilley, Wilkinson & Mills, 2022). This alignment underscores the centrality of ecological health in sustaining fish-based protein production in regions heavily dependent on capture fisheries.

One study that supports this finding highlighted that improving water quality and reducing hydrocarbon contamination significantly enhances fish species diversity and catch volumes among artisanal fishers in the Niger Delta (Nwankwo & Obiekwe, 2021). Their research revealed that fishers became more motivated to increase fishing activities when environmental degradation was reduced, as healthier ecosystems translated into more predictable catch outcomes. This corroborates the present finding because indigenous fish farmers in Bayelsa State face similar environmental challenges, and improvements in ecological conditions naturally strengthen their confidence to engage in continuous fish harvesting for increased protein supply.

A second corroborating finding showed that habitat restoration efforts such as mangrove regeneration and the removal of harmful debris from waterways positively influence the productivity of small-scale fishers by improving breeding and nursery habitats for key fish species (Abah, Okonkwo & Eze, 2020). The authors explained that when ecosystems begin to recover, fishers observe tangible increases in fish abundance, which motivates them to expand their fishing efforts and upgrade their livelihood strategies. This supports the current study's finding, as environmental improvements in Bayelsa State's fishing communities would similarly boost fish availability, thereby encouraging indigenous capture fish farmers to produce more protein-rich fish for local consumption.

A third supporting finding revealed that community-level environmental governance, including pollution monitoring and enforcement of sustainable fishing zones, enhances fishers' willingness to invest time and resources in fishing because it reduces ecological risks and stabilises catch patterns (Babatunde, Adeola & Ibrahim, 2023). According to the study, when fishers perceive the environment as safe, predictable, and well-managed, they become more committed to maintaining regular fishing activities. This resonates with the present finding by demonstrating that environmental improvements not only protect fish stocks but also psychologically motivate fishers to increase production to meet nutritional demands in their communities.

Finally, in Table 4, it revealed that ensuring safe and secure fishing environments will motivate indigenous capture fish farmers for increased protein production in Bayelsa State. This finding corresponds strongly with current evidence affirming that security and safety conditions significantly determine small-scale fishers' willingness to engage actively in fishing. Contemporary fisheries research consistently shows that when fishers feel protected from physical danger, conflict, and theft, their motivation to intensify fishing activities increases markedly (Ezigbo, Onuoha & Eze, 2021). This alignment suggests that secure fishing

environments in Bayelsa State would boost fishers' confidence, enabling them to sustain the level of fishing effort required to enhance protein production for local consumption.

Evidence from recent studies in coastal Nigeria confirms that persistent insecurity, particularly sea piracy, community conflicts, and gear theft reduces fishing frequency and catch volume among artisanal fishers. A recent investigation into fisher livelihoods found that improving maritime safety directly enhanced fishers' motivation to return to fishing grounds, as reduced risks allowed them to focus on harvesting activities rather than personal safety concerns (Okafor & Nwosu, 2022). This corroborates the present finding, as ensuring safe operational waters in Bayelsa State would similarly encourage indigenous capture fish farmers to increase their fishing effort, ultimately contributing to higher protein availability.

Another relevant finding demonstrates that the presence of community-based surveillance systems and strengthened enforcement of fishing rights significantly promotes fisher participation and productivity. A study on small-scale fisheries governance reported that when local fishers perceive fishing zones as well-monitored and free from criminal encroachment, they are more willing to invest in fishing trips, equipment, and longer working hours (Suleiman, Ibrahim & Gimba, 2023). This reinforces the current argument because safe and well-governed fishing environments in Bayelsa State would reduce fear of loss, encourage operational confidence, and support increased capture fish production.

A third corroborating body of evidence indicates that safety infrastructure such as functional waterways, navigational aids, and emergency response systems plays a critical role in sustaining artisanal fishers' motivation. A recent study found that adequate safety infrastructure reduces occupational hazards and enhances fishers' readiness to undertake regular fishing activities, thereby improving overall catch efficiency (Danladi & Hassan, 2021). This observation supports the finding under discussion, as establishing secure and hazard-free fishing environments in Bayelsa State would motivate indigenous capture fish farmers to commit more vigorously to fishing, leading to increased protein production that strengthens local food security.

CONCLUSION

The study concludes that access to affordable and modern fishing equipment significantly motivates indigenous capture fish farmers to enhance their fishing efforts for increased protein production. This implies that when fishers are provided with improved tools such as efficient nets, boats, and preservation facilities, their ability to operate effectively within aquatic environments is greatly enhanced. Such access reduces the physical burden of fishing, improves catch efficiency, and encourages sustained engagement in fishing activities. As a result, fishers are more willing to invest time and energy in harvesting fish, which directly translates into higher yields and improved availability of fish protein for consumption within Bayelsa State communities. The study establishes that provision of low-interest credit schemes strengthens fishers' capacity and motivation to invest in productive fishing activities that boost protein output. This indicates that financial empowerment plays a critical role in enabling indigenous capture fish farmers to overcome capital-related constraints that often limit their productivity. With access to affordable credit, fishers are better positioned to acquire essential fishing inputs, expand their operations, and adopt improved technologies that enhance efficiency. This financial support not only increases their operational capacity but also builds confidence and commitment to remain actively engaged in fishing, thereby contributing to greater fish production and improved protein supply. The study affirms that safe, secure, and environmentally improved fishing conditions strongly motivate indigenous capture fish farmers to increase their fishing engagement for higher protein production in Bayelsa State.

This suggests that the stability and quality of the fishing environment are key determinants of fisher productivity and willingness to operate consistently. When fishing communities are free from insecurity, water pollution, and ecological degradation, fishers experience reduced risk and greater assurance in their livelihood activities. Such favourable conditions encourage more frequent fishing trips, longer working hours, and better exploitation of aquatic resources, ultimately leading to increased fish output and enhanced protein availability for the population.

RECOMMENDATIONS

Providing indigenous capture fish farmers with affordable and modern fishing equipment would significantly improve their efficiency, reduce labour intensity, and strengthen their motivation to increase fishing activities. With better tools such as improved nets, boats, and storage facilities, fishers can operate more effectively and reduce post-harvest losses. This, in turn, would enhance overall fish output and ensure a more stable supply of protein for households and communities across Bayelsa State.

Implementing low-interest credit schemes for fish farmers would enable them to access the financial resources needed to invest in essential fishing inputs and expand their operations. Many fishers are constrained by limited capital, which restricts their productivity and growth. By easing these financial barriers, fish farmers would be better positioned to adopt improved technologies, increase their catch capacity, and sustain higher levels of fish production, thereby strengthening protein availability in the state.

Improving environmental conditions and ensuring safe, secure fishing environments would create a more stable and productive atmosphere for indigenous capture fish farmers. Cleaner waterways, reduced pollution, and effective security measures would lower operational risks and encourage more consistent fishing activities. As fishers gain confidence in the safety and sustainability of their environment, their engagement in fishing is likely to increase, leading to higher fish yields and improved protein supply within local communities.

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Information and Communication Technology Competencies and Utilisation as Predictors of Instructional Delivery among Agricultural Educators in Colleges of Education in Nigeria

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Abstract

This study investigated the levels and predictive relationships among agricultural educators' Information and Communication Technology (ICT) competencies, utilisation rates, and the effectiveness of instructional delivery in Colleges of Education (COEs) across Northeast Nigeria. A correlational and predictive survey research design was adopted. A total of 238 agricultural educators served as the study respondents. Data collection was done using a structured instrument titled Agricultural Educators' ICTs Competencies, Utilisation and Instructional Delivery Questionnaire (AEICUIDQ), which was validated by five independent experts. Trial testing yielded a Cronbach's alpha coefficient of .971, indicating high internal consistency. Descriptive statistics (mean and standard deviation) answered the baseline profile questions, Pearson Product-Moment Correlation analysed individual bivariate relationships, and Multiple Linear Regression tested the global null hypothesis at a .05 level of significance. Descriptive findings revealed that agricultural educators possess a high level of ICT competency but exhibit a moderate level of actual classroom ICT utilisation. Bivariate analysis showed a strong positive relationship between ICT competencies and instructional delivery and a moderate positive relationship between utilisation and instructional delivery. Multiple regression analysis revealed that combined ICT competencies and utilisation significantly predict effective instructional delivery, accounting for 31.7% of the total variance. Based on these findings, it is recommended that Colleges of Education transition from basic digital literacy workshops to advanced training in specialised pedagogical tools (e.g., Learning Management Systems). Furthermore, government and institutional authorities must stabilise electricity and high-speed internet infrastructure and institutionalise verified classroom ICT utilisation as an explicit benchmark for academic staff promotion.

Keywords: ICT Competencies, ICT Utilisation, Effective Instructional Delivery, Agricultural Education, Technical Vocational Education.

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INTRODUCTION

The 21st-century educational landscape demands a notable transformation from conventional "talk and chalk" pedagogical methodologies to robustly integrated Information and Communication Technology (ICT) models. In the context of contemporary teacher education, ICTs serve as a comprehensive suite of technical resources designed to facilitate instructional activities, cultivate critical thinking, and expand universal access to information. Recognising these national priorities, the National Policy on Education and the National Policy on Information and Communication Technology in Education (NPICTE, 2019) require all teacher-training institutions to integrate IT competencies into their programmes. These policies emphasise that digital literacy is essential for improving instructional efficiency and preparing teachers for the demands of a knowledge-based society. In Nigeria, the National Commission

for Colleges of Education (NCCE) (2024) serves as the regulatory body for teacher education institutions tasked with developing middle-level professional personnel. These Colleges of Education (COEs) admit candidates for a three-year programme culminating in the Nigeria Certificate in Education (NCE), qualifying graduates to teach at the pre-primary, primary, and junior secondary school levels.

To standardise technological integration, the NCCE minimum standards document explicitly mandates the provision of both foundational hardware, such as multimedia projectors, public address systems, magnetic boards, and advanced digital resources, including electronic mail, internet connectivity, computer databases, and digital libraries. Within this structural framework, the responsibility of operationalising these resources rests heavily upon the academic staff across specialised disciplines, notably Agricultural Education (Knobloch et al., 2026; Fry et al., 2025). According to Durojaye et al. (2026), Agricultural Education is an intensive, double-major curriculum designed to equip pre-service teachers with the technical knowledge, practical skills, and vocational attitudes necessary to manage model school farms and inspire agricultural interest among secondary school cohorts. The NCCE (2024) maintained that, to effectively drive the nation's agricultural economy. Instructional delivery in this discipline moves beyond passive lecturing to incorporate tutorials, laboratory work, field excursions, and systematic ICT applications.

However, a profound disconnect persists between institutional infrastructure and classroom realities. In the view of Sallau et al. (2022), while COEs across Northeast Nigeria have established physical ICT centers, empirical observations indicate that many agricultural educators remain detached from active technological applications, relying instead on archaic, conventional instructional tools. This also aligns with Emeya, (2024); Terkimbi, (2024) who revealed that, the operational transition from traditional methods to advanced pedagogical tools remains restricted by systemic constraints, including inadequate technical literacy, high software costs, and unreliable digital infrastructure within training institutions.

This gap can be heavily attributed to competency deficiencies. Mishra and Koehler (2006) revealed that ICT competency denotes the synthesis of knowledge, skills, and professional attitudes required to deploy technology effectively within professional practice. This study explicitly addresses the ability of agricultural educators to leverage ICT facilities in teaching. This dimension is theoretically anchored in the Technological Pedagogical Content Knowledge (TPACK) framework, which establishes that hardware cannot revolutionise learning unless wielded by an educator who understands the intersection of technology, pedagogy, and utilisation.

Pelgrum (2001) defines ICT utilisation as the frequency, management, and organisation of technological resources for practical instructional purposes. True utilisation extends beyond administrative familiarity; it represents the systemic integration of software, interactive boards, and digital resources to stimulate student engagement and systematically guide large classroom cohorts. Crucially, utilisation is highly dependent upon institutional availability, internet connectivity, and infrastructural reliability (Bandaru, 2026; Purnamasari et al, 2025). Consequently, optimal ICT utilisation directly facilitates effective instructional delivery.

Effective instructional delivery encompasses the interpersonal skills and systemic strategies an educator uses to transfer knowledge, skills, and attitudes to learners. In this study, effective delivery is operationalised as the successful attainment of the educational goals of the Agricultural Education program via ICT mediation, resulting in optimised student engagement and measurable learning outcomes (Aneke, 2015; Emeana et al., 2020). According to Ibezim (2017), effective instructional delivery is a multifaceted teaching variable that relies heavily on

the teacher's interpersonal communication and structured pedagogical strategies to successfully bridge the gap from curriculum to student understanding.

The core of the problem in educational technology integration lies in an institutional assumption: that the mere assembly of hardware components within an un-networked or power-deficient laboratory equates to educational modernization (Adebayo & Mensah, 2022). As extensively documented in educational research, the presence of hardware does not guarantee instructional quality (Lawal et al., 2024; Smith & Jones, 2020). In Northeast Nigeria, a region facing unique socioeconomic and educational challenges, the failure to optimise these technologies directly undermines the instructional delivery of agricultural educators (Bukar, 2023). Consequently, a critical gap remains regarding how the internal ICT competencies of these educators and their actual utilisation rates interact to predict instructional outcomes. In an attempt to fill this gap, the researchers embarked on this study.

Purpose of the Study

The broad purpose of this study was to investigate the relationship between agricultural educators' ICT competencies, utilisation, and instructional delivery in Colleges of Education, Northeast Nigeria. Specifically, the study sought to:

1. Determine the descriptive levels of ICT competencies and utilisation among agricultural educators; and
2. Determine if agricultural educators' ICT competencies and utilisation rates significantly predict their effective instructional delivery.

Research Questions

The study was guided by the following research questions.

1. What are the descriptive levels (means and standard deviations) of ICT competencies and utilisation among agricultural educators in Colleges of Education in Northeast Nigeria?
2. To what extent do ICT competencies and ICT utilization predict instructional delivery among agricultural educators?

Hypothesis

The following null hypothesis was formulated and tested at a .05 level of significance:

$H0_1$: Agricultural educators' levels of ICT competencies and utilisation do not significantly predict their effective instructional delivery in Colleges of Education, Northeast Nigeria.

METHODOLOGY

This study adopted a correlational and predictive survey research design. Correlational and predictive research designs produce mathematical indexes that reveal the direction, degree, and predictive strength of relationships among variables using the entire operational range of those variables without active manipulation (Ary et al., 2010; Creswell, 2016). The study was conducted in the Northeast geopolitical zone of Nigeria, comprising six states: Adamawa, Bauchi, Borno, Gombe, Taraba, and Yobe. The zone features a considerable number of public and private tertiary institutions, including 33 Colleges of Education spread across the sub-region (Joint Admissions and Matriculation Board [JAMB], 2023). The target population for this study consisted of all 238 Agricultural Education lecturers operating across the 15 Colleges of Education (comprising 4 Federal, 9 State, and 2 Private institutions) that run the Agricultural

Education curriculum within the zone. Because the total population was small, and administratively accessible, a complete census approach was implemented, retaining all 238 educators as active respondents (*N*=238). The data collection instrument was a structured questionnaire titled Agricultural Educators' ICTs Competencies, Utilisation and Instructional Delivery Questionnaire (AEICUIDQ), developed by the researchers based on validated literature parameters. The questionnaire (instrument) is divided into two (2) parts, A and B. Part A is concerned with the personal information of the respondents. Part B of the questionnaire is concerned with items based on the research questions on a 4-point rating scale anchored on a continuum of Very High Level (VHL), High Level (HL), Moderate Level (ML), Low Level (LL) with corresponding values of ,4, 3, 2, and 1 respectively. Part B is divided into three clusters; I-III consisting of eighty-one (81) Items. Cluster I addresses ICTs Level of Competencies of Agricultural Educators, Cluster II addresses Level of ICTs Utilization by Agricultural Educators while Cluster III is concerned with Level of Effective Instructional Delivery by Agricultural Educators. The instrument underwent face, content and construct validation by a panel of five experts drawn from vocational agricultural education, extension disciplines, and psychometrics across Modibbo Adama University Yola, University of Eswatini, and Joseph Sarwuan Tarka University, Makurdi. To establish internal consistency, the instrument was trial-tested on 21 agricultural education lecturers from the Federal College of Education, Zaria, an institution outside the geographical target zone but sharing matching socio-structural and infrastructural institutional profiles. The data from the trial test was processed via the Cronbach's alpha technique, yielding an overall reliability coefficient of .971 with cluster I having .988, Cluster II having .993 and Cluster III having .993 reliability coefficient respectively confirming the instrument's high structural adequacy and reliability. Data collection was executed via an on-the-spot administration method managed by the primary researchers and eight trained research assistants, resulting in a 100% retrieval rate (*N*=238). Quantitative data were analysed using SPSS software. Research Question 1 was addressed via descriptive statistics, specifically Mean ($\bar{X}$) and Standard Deviation (*SD*). Research Question 2 and the corresponding Null Hypothesis were analysed using Multiple Linear Regression Analysis evaluated at an alpha level of α=.05.

RESULTS

Research Question 1

What are the descriptive levels (means and standard deviations) of ICT competencies and utilisation among agricultural educators in Colleges of Education in Northeast Nigeria?

Table 1: Descriptive Statistics for Agricultural Educators' ICT Competency and Utilisation (*N*=238)

Variables	Mean ($\bar{X}$)	Std. Deviation (*SD*)	Interpretation
ICT Competency Level	3.62	0.45	High Competency Level
ICT Utilisation Level	3.40	0.61	Moderate Utilisation Level
Instructional Delivery	3.55	0.52	Effective Delivery Level

The descriptive statistics in Table 1 indicate that agricultural educators exhibit a high level of overall technology competence ($\bar{X}$=3.62, *SD*=0.45). However, their actual classroom utilisation rate drops to a moderate level ($\bar{X}$=3.40, *SD*=0.61), signaling a structural gap between their personal capabilities and empirical classroom deployment.

Research Question 2

To what extent do ICT competencies and ICT utilization predict instructional delivery among agricultural educators?

Table 2: Pearson Correlation Matrix for Measured ICT and Instructional Variables (*N*=238)

Measured Variables	ICT Competency	ICT Utilisation	Instructional Delivery
ICT Competency			
Pearson Correlation (*r*)	1	.412*	.512*
Sig. (2-tailed)		.000	.000
ICT Utilisation			
Pearson Correlation (*r*)	.412*	1	.341*
Sig. (2-tailed)	.000		.000
Instructional Delivery			
Pearson Correlation (*r*)	.512*	.341*	1
Sig. (2-tailed)	.000	.000	

* Correlation is mathematically significant at the p<.001 level (2-tailed).

As shown in Table 2, all bivariate correlation coefficients are statistically significant with true probability values consistent with the sample size (p<.001). According to Cohen's standard evaluation criteria, the correlation between ICT Competency and Instructional Delivery (r=.512, p<.001) represents a large effect size, indicating a strong positive individual association. Conversely, the correlation between ICT Utilisation and Instructional Delivery (r=.341, p<.001) and the intra-variable correlation between Competency and Utilisation (r=.412, p<.001) correspond to medium/moderate effect sizes. This implies that standalone core digital competence shares a stronger baseline relationship with instructional outcomes than the current erratic utilisation rates.

$H0_1$: Agricultural educators' levels of ICT competencies and utilisation do not significantly predict their effective instructional delivery in Colleges of Education, Northeast Nigeria.

Table 3: Multiple Linear Regression Analysis Matrix for Instructional Predictive Variance

Model	R	R2	Adjusted R2	Std. Error of the Estimate	F	df1	df2	Sig. (p)
1	.563[a]	.317	.312	14.956	54.647	2	235	< .001[b]

a. Predictors: (Constant), ICT Utilisation Level, ICT Competency Level
b. Dependent Variable: Effective Instructional Delivery

The regression data in Table 3 shows a multiple correlation coefficient (R) of .563, indicating a strong combined positive relationship among the variables. The corresponding coefficient of determination ($R2$) is .317, demonstrating that 31.7% of the total variance in effective instructional delivery is directly accounted for and predicted by the linear combination of agricultural educators' ICT competencies and utilisation rates. This implies that 68.3% of the remaining instructional variance is driven by extraneous variables outside the scope of this model.

The global model achieved high statistical significance ($F(2,235)=54.647$, $p<.001$). Because the observed probability value ($p=.000$) is substantially lower than the designated alpha level ($\alpha=.05$), the null hypothesis ($H0$) is completely rejected. The structural inference confirms that agricultural educators' ICT competencies and utilisation levels significantly predict effective instructional delivery within the study area.

Discussion of Findings

The findings of this study offer a nuanced look at the digital readiness of agricultural educators. On one hand, the descriptive data reveals a high ICT competency profile ($\bar{X}=3.62$), suggesting that lecturers have successfully acquired prerequisite technical skills, likely through individual initiative and professional workshops. These established skill areas include using MS Word, Excel, and PowerPoint, managing digital storage media, navigating online search engines, operating multimedia projectors, and maintaining communication via mobile and social media networks. This observed high competency profile mirrors the transition described by UNESCO (2023) in their ICT Competency Framework for Teachers, where educators move systematically from basic 'Technology Literacy' into advanced 'Knowledge Deepening' frameworks. Furthermore, individual and TRCN-led capacity-building alignments correspond with the assertions of Ndem (2016) and Babayo and Kesiki (2019), who argue that contemporary vocational agricultural lecturers must proactively adapt to technological shifts to maintain pedagogical efficiency within modern tertiary structures.

However, the moderate actual utilisation rate ($\bar{X}=3.40$) uncovers a critical operational bottleneck: training alone does not automatically guarantee consistent classroom deployment. This finding aligns closely with the foundational tenets of Ertmer and Ottenbreit-Leftwich (2010), who demonstrate that pedagogical technology knowledge (second-order factors) cannot fully manifest in practical environments if severe first-order environmental barriers remain unaddressed. In the context of Northeast Nigerian COEs, these systemic constraints are primarily environmental and infrastructural.

Gonfa and Tulu (2024) and Kaur (2023) observed that in developing educational landscapes, erratic power supply and deficient laboratory infrastructure act as major inhibitory factors that prevent even highly tech-savvy educators from using consistent digital tools usage. Furthermore, the operational time constraints identified in this region mirror the findings of Meléndez and Rojas (2021), who noted that heavy academic workloads and the time-intensive setup required for un-networked ICT frequently force educators to revert to traditional instructional methods to meet rigid institutional curriculum deadlines. Thus, environmental stability is the required bridge for actual utilisation.

From a predictive standpoint, the statistical analysis highlights the power of technology when it is fully embraced. The strong bivariate correlation (r=.512, p<.001) between competence and instructional delivery confirms that when educators are proficient in digital tools, the quality of knowledge transfer improves significantly. When evaluated jointly within the regression model (R=.563, p<.001), competency and utilisation explain 31.7% of the total variance in instructional effectiveness.

CONCLUSION

This study establishes that there is a significant positive relationship and predictive model connecting the ICT competencies of agricultural educators, their actual utilisation rates, and the overall effectiveness of their instructional delivery within Colleges of Education across Northeast Nigeria. While it is encouraging that these educators have attained high self-reported technical skills, the critical transition from personal competence to consistent classroom application remains hindered by systemic environmental, infrastructural, and structural challenges. The empirical data demonstrate that nearly one-third (31.7%) of total instructional delivery effectiveness is directly predicted by the functional synergy of digital skill and actual tool usage. Consequently, achieving the strategic benchmarks of 21st-century agricultural pedagogy requires moving beyond basic literacy training; it demands the institutional cultivation of a reliable, stable educational ecosystem that actively supports the practical application of digital resources across both laboratories and lecture halls.

RECOMMENDATIONS

Based on the empirical evidence verified in this study, the following recommendations are proposed:

1. Advanced Pedagogical Training Programs: Colleges of Education must evolve their institutional professional development frameworks beyond basic computer literacy. Training programs should focus on advanced pedagogical tools, such as Learning Management Systems (LMS), interactive whiteboards, and digital farm simulation software specifically tailored to modern agricultural instructions.

2. Infrastructural Revitalisation: Government agencies (such as TETFUND) and private stakeholders must prioritise the sustainable provision of stable electricity grids, backup solar power arrays, and high-speed campus internet connectivity within COEs to ensure agricultural educators can transition from theoretical competency to consistent practical utilisation.

3. Institutional Policy Reform: To bridge the utilisation gap, institutional authorities should modify academic staff evaluations. Verified ICT literacy and its demonstrated practical application in agricultural classroom instructions should be institutionalized as a mandatory, core criterion for the promotion of academic staff.

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Teachers' Digital Competencies as Correlates of Students' Learning Outcomes in Public Secondary Schools in South-East Nigeria

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Abstract

This study determined the relationship between teachers' digital competencies and students' learning outcomes in Public Secondary Schools in South East, Nigeria. Two research questions and null hypotheses in line with two specific objectives guided the study. The study adopted a correlational survey research design. The population of the study comprised 16,388 teachers (including principals) from 1,140 public secondary schools across 21 Education Zones in the five states of South East Nigeria (Abia, Anambra, Ebonyi, Enugu, and Imo States). A sample size of 391 comprising 298 teachers and 93 principals was used for the study. The sample was determined using Taro Yamane's formula. Two-stage sampling technique was used for the study. The instruments for data collection were "Teachers' Digital Competencies Questionnaire (TDCQ)" and "Students' Learning Outcome Questionnaire (SLQ)". The instruments were validated by three experts in Educational measurement and evaluation and Educational Management at Michael Okpara University of Agriculture, Umudike. Reliability was established using test-retest. The reliability text yielded coefficients of .867 and .958 for TDCQ and .949 for SLQ. Cronbach Alpha split-half reliabilities coefficient of .943 was obtained for TDCQ and .946 for SLQ. Six well-briefed research assistants helped in the administration and collection of the instruments. Out of the 391 copies of the questionnaires administered, 383 copies each representing 97 percent return rate were collected and used for data analysis. Pearson Product Moment Correlation Coefficient was used to answer the nine research questions while linear regression analysis tested the nine null hypotheses at 0.05 level of significance. The findings showed that digital learning management system and digital information management to a very high extent relate to students' learning outcomes in Public Secondary Schools in South East, Nigeria. Based on the findings, it was recommended among others that teachers should receive specialized training on effective utilization of digital learning management systems so they can create and manage online courses, track learner progress, host resources, and integrate interactive tools that promote better learning outcomes.

Keywords: Teachers' digital competencies, digital learning management system, digital information management system, Students' learning outcomes, Public secondary schools.

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INTRODUCTION

The rapid advancement of technology has revolutionized the way people live, work, and learn, and this has brought profound changes to the education sector. The 21st century has witnessed an increasing reliance on digital tools such as computers, smartphones, the internet, online platforms, and educational software. These technologies have altered teaching and learning processes, making it necessary for teachers to develop digital competencies that will enable them to deliver instruction effectively in a technology-driven environment. As a result, the growing use of digital technology in education has continued to influence how students learn and how their learning outcomes are shaped (Koehler & Mishra, 2019).

Teaching and learning are central to the achievement of educational goals, and the effectiveness of the process depends largely on the competence of the teacher. The classroom is no longer limited to chalkboard instruction alone, as learners now require more engaging, interactive, and technology-supported experiences. Students' learning outcomes are statements of what learners are expected to know, understand, and demonstrate after instruction (Kenkwo, 2024). These outcomes may be reflected in the cognitive, affective, and psychomotor domains. In the context of this study, students' learning outcomes refer to the overall achievement of students in public secondary schools after exposure to classroom instruction and learning experiences. Learning outcomes remain a major indicator of the quality and effectiveness of education because they show whether students have acquired the knowledge, skills, and attitudes expected from schooling (Kuh et al., 2015; OECD, 2018).

Students' learning outcomes are strongly influenced by the quality of teaching they receive. Teachers are therefore key to the success of any educational system because they design instruction, guide learners, assess progress, and provide feedback that supports learning. Blazar (2016) emphasized that teacher-student interaction has a strong effect on students' attitudes, behavior, and academic outcomes. Teachers who use effective instructional practices are more likely to promote better learning outcomes, while those who struggle to adapt their teaching to modern demands may limit students' achievement. In the digital age, this responsibility has become even more important because teachers are now expected to integrate technology into their instructional practices in ways that support deeper learning, better engagement, and improved performance.

The effective use of technology in teaching depends largely on teachers' digital competency. Digital competency refers to the ability to use digital tools, technologies, and systems to perform tasks effectively in educational and professional settings. It includes the knowledge, skills, and attitudes needed to navigate digital environments, manage information, and apply digital systems to support teaching and learning. According to Krumsvik (2021), digital competence involves using digital technologies confidently, critically, and creatively for personal, educational, and professional purposes. In schools, digital competency helps teachers to organize learning activities, monitor students' progress, and communicate more efficiently with learners. This makes digital competency an important factor in improving students' learning outcomes in public secondary schools.

For teachers, one important dimension of digital competency is the ability to use a learning management system(LMS). A learning management system is a digital platform that supports the creation, delivery, monitoring, and management of learning activities. It enables teachers to upload lesson materials, assign tasks, track learner participation, and provide feedback. LMS competency allows teachers to design and manage online or blended learning experiences, making instruction more organized and interactive (Nguyen, 2019). Al-Azawei et al. (2020) noted that learning management system competency is essential for educators because it supports teaching, learning, and assessment. Teachers who are competent in LMS use are better able to create engaging lessons, monitor students' activities, and support academic success. This is particularly important in secondary schools where students need structured and guided learning experiences.

Another important dimension of digital competency is information management system (IMS) competency. An information management system is a computer-based system used to collect, store, organize, retrieve, and disseminate information within an institution (Owolabi, 2017). In schools, it helps teachers and administrators to manage student records, attendance, academic performance, and other important data. Information management systems can improve decision-making, efficiency, and organizational effectiveness in institutions (Ahmed

et al., 2020). For teachers, IMS competency means the ability to use digital systems to track students' progress, manage records, and make informed instructional decisions. This can enhance teaching effectiveness and improve students' learning outcomes because it allows teachers to respond more quickly to learners' needs. According to Eze et al., (2025), information management systems improve the speed and quality of decision-making in educational institutions.

Teachers who possess strong digital competencies are more likely to create a supportive and productive learning environment. They can use digital platforms to deliver lessons, share resources, assess students, and maintain communication with learners. These competencies can help reduce administrative burden, improve lesson planning, and make classroom instruction more efficient. When digital systems are effectively used, students benefit from better access to learning materials, timely feedback, and more structured learning experiences. This may improve their understanding, motivation, and overall performance. In contrast, teachers who lack digital competency may find it difficult to use digital systems effectively, which can affect the quality of instruction and students' learning outcomes.

In South East Nigeria, public secondary schools are increasingly expected to adapt to digital change in education. However, there are still concerns about the extent to which teachers possess the digital competency required to use learning management systems and information management systems effectively. Some teachers may not have the skills needed to manage digital platforms, track students' records, or use digital tools to support instruction. Where such competencies are lacking, teaching may remain limited to traditional methods that may not adequately prepare students for contemporary academic demands. This situation makes it necessary to examine the relationship between teachers' digital competency and students' learning outcomes in public secondary schools in South East Nigeria.

Previous studies have shown that digital systems can influence students' learning outcomes in different educational settings. Okonkwo (2019) found that learning management systems were under-utilized in tertiary institutions due to lack of digital skills, inadequate infrastructure, and insufficient training. Ayeni (2021) reported that students taught using learning management systems performed significantly better than those taught without them. Ifinedo (2017) found that regular use of learning management systems positively influenced students' grades and engagement. Udo (2020) observed that information management systems improved record keeping and service delivery in university libraries, while Wanjala (2021) reported that information management systems improved data accuracy and decisionmaking in hospitals. Mensah (2019) also found a moderate positive relationship between information management systems and academic performance in secondary schools. These studies suggest that digital systems are important for improving performance and effectiveness in different contexts.

Despite these findings, there is still limited empirical evidence on how teachers' digital competency, especially in learning management system and information management system use, relates to students' learning outcomes in public secondary schools in South East Nigeria. This creates a gap in knowledge that this study sought to fill. Therefore, the present study investigated teachers' digital competency as correlate of students' learning outcome in public secondary schools in South East Nigeria.

Statement of the Problem

Teachers play a vital role in influencing students' learning outcomes in public secondary schools. They are responsible for planning and delivering instructions, managing classroom activities, assessing learning, and creating learning experiences that support students'

understanding and achievement. In the digital age, teachers are also expected to use digital tools such as learning management systems and information management systems to improve instruction, monitor student progress, and make teaching more effective.

However, many public secondary schools in South East Nigeria still face challenges in this regard. Some teachers do not possess the digital competence needed to use learning management systems and information management systems effectively. As a result, teaching and learning may still rely heavily on traditional methods that do not fully support students' learning needs in a technology-driven world. Where teachers are unable to use these digital systems well, students may miss opportunities for more engaging, organized, and interactive learning experiences.

This situation raises concern because students' learning outcomes may be affected when teachers lack the digital competencies needed for modern teaching. Despite the increasing importance of digital systems in education, there is still limited empirical evidence on how teachers' digital competency relates to students' learning outcomes in public secondary schools in South East Nigeria. It is against this background that this study seeks to investigate teachers' digital competency as correlate of students' learning outcome in public secondary schools in South East Nigeria.

Purpose of the Study

The main purpose of this study is to investigate the correlation between teachers' digital competencies and students' learning outcomes in public secondary schools in South East, Nigeria. Specifically, the study sought to;

1. find out the relationship between teachers' learning management system (LMS) competency and students' learning outcomes in Public Secondary Schools in South East, Nigeria.
2. determine the relationship between teachers' information management system (IMS) competency and students' learning outcomes in Public Secondary Schools in South East, Nigeria.

Research Questions

The following research questions guided the investigation of this study:

1. What is the relationship between teachers' Learning Management System (LMS) competency and students' learning outcomes in Public Secondary Schools in South East, Nigeria?
2. What is the relationship between teachers' Information Management System (IMS) competency and students' learning outcomes in Public Secondary Schools in South East, Nigeria?

Hypotheses

The following null hypotheses were formulated to guide the study and were tested at 0.05 level of significance:

$H0_1$: There is no significant relationship between teachers' Learning Management System (LMS) competency and students' learning outcomes in Public Secondary Schools in South East, Nigeria

$H0_2$: There is no significant relationship between teachers' Information Management System (IMS) competency and students' learning outcomes in Public Secondary Schools in South East, Nigeria

METHODOLOGY

The study adopted a correlational survey research design to determine the relationship between teachers' digital competencies and students' learning outcomes in public secondary schools in South East Nigeria. The study was conducted in South East Nigeria, which comprises Abia, Anambra, Ebonyi, Enugu, and Imo States. The population for the study consisted of 16,388 respondents, comprising teachers and principals from 1,140 public secondary schools across the five states of South East Nigeria. A sample of 391 respondents, consisting of teachers and principals in South East Nigeria, was used for the study. The sample size was determined using Taro Yamane formula. A two-stage sampling technique was employed for the study. In the first stage, proportionate stratified random sampling was used to determine the number of respondents to be selected from each state based on the population distribution. This ensured that each state was adequately represented in proportion to its population size. In the second stage, simple random sampling was employed to select the schools within each state and education zone. All schools were assigned unique identification numbers, and random selection was used to choose the required schools until the sample size for each state was achieved. This procedure ensured that each school had an equal probability of being selected, thereby eliminating selection bias and ensuring a representative sample. The instrument for data collection was a questionnaire developed by the researcher titled "Teachers' Digital Competencies Questionnaire (TDCQ)" and "Students' Learning Outcome Questionnaire (SLQ)". Items on the questionnaire were arranged in clusters to assess digital learning management system and digital information management system as they relate to students' learning outcomes in public secondary schools in South East Nigeria. The questionnaire adopted a 4-point rating scale with response options of Very High Extent (VHE) - 4 points, High Extent (HE) - 3 points, Low Extent (LE) - 2 points, and Very Low Extent (VLE) - 1 point. The instrument was face-validated by three experts from Michael Okpara University of Agriculture, Umudike. The validators examined the questionnaire for clarity of language, relevance of items, and appropriateness of the response format. Their suggestions and corrections were incorporated into the final version of the instrument. The reliability of the instrument was determined using the test-retest reliability method and Cronbach Alpha which recorded reliability coefficients of 0.84, 0.84, respectively and an overall internal consistency of 0.840 for the TDCQ. The *SLO*Q recorded a reliability coefficient of 0.847. The researcher, with the help of six trained research assistants, administered the questionnaires to the respondents in their respective schools. The research questions were answered using Pearson Product Moment Correlation Coefficient, while linear regression analysis was used to test the null hypotheses at 0.05 level of significance. The decision rule was that null hypotheses were retained if the p-value was greater than 0.05; otherwise, the null hypotheses were rejected.

RESULTS

Research Question One: What is the relationship between teachers' digital learning management system competency and students' learning outcomes in Public Secondary Schools in South East, Nigeria?

Table 1: Correlation Matrix of Relationship between teachers' digital Learning Management System competency and students' learning outcomes in Public Secondary Schools in South East, Nigeria.

		LMSC	SLO
LMSC	Pearson Correlation	1	.862**
	Sig. (2-tailed)		.000
	N	383	383
SLO	Pearson Correlation	.862**	1
	Sig. (2-tailed)	.000	
	N	383	383
	R2	.743 (74.3%)	

***. Correlation is significant at the 0.01 level (2-tailed). LMSC = Learning Management System Competency; SLO = Students' Learning Outcome*

Data in Table 1 indicates a correlation coefficient (r) of .862** which is positive and within the coefficient limit of + .70 – 1.00 and indicating strong, positive and very high extent relationship. This implies that teachers' digital learning management system competency to a very high extent relates to students' learning outcomes in Public Secondary Schools in South East, Nigeria. The coefficient of determination (R^2) of .743 indicates that 74.3% of the variance observed in students' learning outcomes in Public Secondary Schools in South East, Nigeria was accounted for by teachers' digital learning management system competency.

Hypothesis One: There is no significant relationship between teachers' digital learning management system competency and students' learning outcomes in Public Secondary Schools in South East, Nigeria

Table 2: Linear Regression Analysis of the Relationship between teachers' digital Learning Management System competency and students' learning outcomes in Public Secondary Schools in South East, Nigeria

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	186.500	1	186.500	1097.058	.000[b]
Residual	64.602	381	.170		
Total	251.102	382			

a. Dependent Variable: Students' Learning Outcome
b. Predictors: (Constant), Teachers' Digital Learning Management System Competency

The result in Table 2 shows that an F-test value of 1097.058 with an associated probability (p-value) of 0.000 was obtained. This probability value of 0.000 was compared with 0.05 set as the level of significance for testing the hypothesis and it was found to be significant because 0.000 is less than 0.05. The null hypothesis, which stated that there is no significant relationship between teachers' digital learning management system competency and students' learning outcomes in Public Secondary Schools in South East, Nigeria, is therefore rejected. The inference drawn is that teachers' digital learning management system competency has a

significant influence on students' learning outcomes in Public Secondary Schools in South East, Nigeria.

Research Question Two: What is the relationship between teachers' digital information management system competency and students' learning outcomes in Public Secondary Schools in South East, Nigeria?

Table 3: Correlation Matrix of Relationship between teachers' digital information management system competency and students' learning outcomes

		IMSC	SLO
IMSC	Pearson Correlation	1	.720**
	Sig. (2-tailed)		.000
	N	383	383
SLO	Pearson Correlation	.720**	1
	Sig. (2-tailed)	.000	
	N	383	383
	R2	.518 (51.8%)	

***. Correlation is significant at the 0.01 level (2-tailed). IMSC = Information Management System Competency; SLO = Students' Learning Outcome*

Data in Table 3 indicate a correlation coefficient (r) of .720** which is positive and within the coefficient limit of + .70 – 1.00 and indicating strong, positive and very high extent relationship. This implies that teachers' digital information management system competency to a very high extent relates to students' learning outcomes in Public Secondary Schools in South East, Nigeria. The coefficient of determination (R^2) of .518 indicates that 51.8% of the variance observed in students' learning outcomes in Public Secondary Schools in South East, Nigeria was accounted for by teachers' digital learning management system competency.

Hypothesis Two: There is no significant relationship between teachers' digital information management system competency and students' learning outcomes in Public Secondary Schools in South East, Nigeria

Table 4. Linear Regression Analysis of the Relationship between teachers' digital information management system competency and students' learning outcomes in Public Secondary Schools in South East, Nigeria

Model	Sum of Squares	df	Mean Square	F	Sig.
1Regression	130.031	1	130.031	408.902	.000[b]
Residual	121.070	381	.318		
Total	251.102	382			

a. Dependent Variable: Students' Learning Outcome
b. Predictors: (Constant), Teachers' Digital Information Management Competency

The result in Table 4 shows that an F-test value of 408.902 with an associated probability (p-value) of 0.000 was obtained. This probability value of 0.000 was compared with 0.05 set as the level of significance for testing the hypothesis and it was found to be significant because 0.000 is less than 0.05. The null hypothesis, which stated that there is no significant relationship between teachers' digital information management system competency and students' learning outcomes in Public Secondary Schools in South East, Nigeria, is therefore rejected. The inference drawn is that teachers' digital information management system competency has a

significant influence on students' learning outcomes in Public Secondary Schools in South East, Nigeria.

Discussion of Findings

The findings of this study revealed that teachers' learning management system competency to a very high extent relates to students' learning outcomes in Public Secondary Schools in South East, Nigeria. This implies that teachers capable of using learning management systems (LMS) are likely to enhance students' learning outcomes by effectively creating and managing online courses and learning materials through the LMS, tracking and monitoring students' progress and engagement, facilitating online discussions, group work, and collaboration among students, administering online assessments and quizzes, providing timely and constructive feedback on student work and progress, customizing the LMS to meet specific student and course requirements, troubleshooting technical issues related to the LMS efficiently, and integrating multimedia resources and tools within the LMS to enhance student learning. This supports the findings of Ayeni (2021) on the effectiveness of learning management systems in enhancing teaching and learning at FUTO, Minna, which showed that students taught using LMS performed significantly better than those in control groups, with positive influences on engagement and subject matter understanding. The finding is consistent with the findings of Ifinedo (2017) on the impact of learning management systems on student engagement and learning outcomes in Canada, which demonstrated that active participation in LMS forums positively influenced academic performance and led to higher grades for regular users. It further corroborates Okonkwo (2019) on the utilization of learning management systems for instructional delivery in tertiary institutions in Lagos State, which highlighted the potential of LMS tools when supported by adequate teacher digital skills, despite noted under-utilization barriers.

The findings of this study also revealed that teachers' information management competency to a very high extent relates to students' learning outcomes in Public Secondary Schools in South East, Nigeria. This implies that teachers that adapt information management systems (IMS) are likely to enhance students' learning outcomes by effectively using the IMS to manage students' records and data, tracking students' attendance, grades, and progress, generating reports and analyzing data to inform instructional decisions, organizing digital resources and materials, communicating with parents and guardians about student progress and performance, and troubleshooting technical issues related to the IMS efficiently. This is consistent with the findings of Mensah (2019) on the evaluation of information management systems and academic performance in secondary schools in Central Region of Ghana, which showed a moderate positive relationship between IMS use and students' academic performance, particularly in schools effectively tracking progress, attendance, and feedback. The findings corroborated Udo (2020) on the assessment of information management practices in selected university libraries in South-West, Nigeria, which indicated that IMS adoption significantly improved record keeping and service delivery despite skill gaps among staff. It further supported Wanjala (2021) on the impact of information management systems on decision making in public hospitals in Nairobi County, Kenya, which demonstrated improvements in data accuracy, decision speed, and error reduction through IMS use.

CONCLUSION

Based on the findings of this study, it was concluded that teachers' digital competencies have a significant relationship with students' learning outcomes in public secondary schools in South East Nigeria. In particular, digital learning management system and digital information management system were found to relate strongly to students' learning outcomes. This

suggests that when teachers are more competent in managing digital learning platforms and handling information digitally, students are more likely to experience better learning outcomes. There is therefore a need for schools and educational authorities to strengthen teachers' digital competencies through regular training, improved support, and better access to digital tools and systems.

RECOMMENDATIONS

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

1. Teachers should receive specialized training on effective utilisation of Learning Management Systems so that they can create and manage online courses, track learner's progress, host resources, and integrate interactive tools that promote better learning outcomes.
2. School systems should organize workshops on Information Management Systems for teachers to strengthen their capacity to manage students' records, track attendance and achievement, generate reports, and use data to inform instructional decisions.

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Learning Styles and Attitude as Correlates of Academic Achievement Among Public Secondary School Students in Benin City, Edo State Nigeria

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Abstract

This study investigated the relationship between learning styles, students' attitude and the academic achievement of public secondary school students in Benin City. The study was guided by two hypotheses tested at 0.05 level of significance. A survey research design using correlation approach was employed. The sample of the study was 741 students drawn from six public senior secondary schools using the multi-stage sample technique. The instruments for data collection was Adolescent Personal Learning Styles Inventory (APLSI) and Students' Attitude of Learning Scale (SALS) which was validated by three experts in the Department of Educational Evaluation and Counselling Psychology University of Benin. The reliability coefficient of 0.82 and 0.72 was obtained for the instruments respectively. Also, students second term results in English language for the 2023/2024 academic session was used to determine their academic achievement. Hypothesis 1 was tested with Analysis of Variance ANOVA Statistics while hypotheses 2 was tested with Pearson Product Moment Correlation Statistics. The finding of the study revealed that learning styles is a predictor of students' academic achievement in Benin City. Student attitude significantly correlated with academic achievement. Based on the findings of this study, it was recommended that counsellors and teachers should lay emphasis on learning styles that will best help students in their academic journey. Students are to be encouraged to develop positive attitude towards learning of any subject. This will help them learn better and achieve academically.

Keywords: Learning style, student attitude, and academic achievement.

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INTRODUCTION

Academic achievement refers to the extent to which a student has attained educational goals, learning outcomes or standards set by a school or educational institution. It reflects how well a learner performs an academic activity through test, examinations, continuous assessment and overall school performance. Academic achievement according to Adeyemi and Okotie (2023) is the sum total of the outputs from the individual inputs mediated through certain structural operations. It is a multidimensional element of how an individual can be described in broad or general terms. Muhammad and Asma'u (2016) opined that academic achievements is the extent to which students cope with their studies about the stipulated aim and objectives of the school. It reflects the student's ability to communicate the knowledge they have acquired within given period. Psychologist, counselors, teachers and over educationists are becoming, more concerned with the academic achievement of students in various subject areas and the factors responsible for such performance.

Records of the West African Examination Council (WAEC) a major examination body in the West African sub-region showed that students performance in the examination has not improve over the years as the percentage of those who passed the examination at credit level

and above was relatively low. According to WAEC, students' results from the year 2020 to 2025 indicated that students' academic performance is not stable. For instance in 2020 WASSCE recorded a pass rate of 65.24% of candidates who obtain five credits including English Language and mathematics, in 2021 there was a significant improvement with a pass rate of 81.70%, but in 2022 there is a sharp decline in performance students' performance was reported to be 75.36% indicating a drop of over 5%, in 2023 there was a recovery in performance as the pass rose to 79.81%, in 2024 performance dropped to 72.12% and in 2025 that is a drastic decline in performance with student with students pass rate reported as 38.32% but was later adjusted to 62.96%. The analysis shows that students' performance in WASSCE between 2020 and 2025 is inconsistent, fluctuating and poor. However, commendable students' academic achievement could depend on some psychological factors such as learning styles, and student attitude towards learning which is the focus of this study.

Learning style refers to the various ways individuals prefer to absorb, process, and retain information (Reid, 2024). It is a concept widely studied in psychology, education, and instructional design, as understanding learning preferences can enhance teaching strategies and improve educational outcomes. Although there is ongoing debate about the effectiveness and validity of categorizing learners by style, the concept of learning styles continues to be influential in many educational settings. Recognizing and adapting to individual learning preferences can lead to more engaging and effective instruction, thereby fostering deeper understanding and retention of knowledge. Learning depends upon many personal factors and everyone has a distinct learning style. Learning style according to Osarunmwense and Oteze (2020), is a biologically and developmentally determined set of personal characteristics that make the identical instruction effective for some students and ineffective for others.

In the teaching and learning process it has been observed that there are different learning styles and these include visual (spatial) learners which prefers the use of pictures, images, diagrams, colours and mind maps to learn; kinesthetic (tackle/physical) learners that use their body to assist their learning in drawing, physical objects and touching; auditory (aural) learners, learners prefer using sound, rhythms, rhymes, music and songs while learning; verbal (linguistics) learners are individuals who prefer to learn using words in speech, writing and listening to others under learning conditions. Considering the different learning styles available and their special attributes, there is therefore the need for the individual learner to understand these different learning styles so as to be conscious of what will help him to learn better and apply the learning style that yields better results or academic outcome.

Another variable that can influence students' academic achievement is the attitude of students towards learning. It refers to active state of readiness which makes an individual react to a particular issue or situation. Taghap et al (2024) refers to attitude as a common multidimensional construct consisting of cognitive, affective and behavioral components which shapes how individuals respond to tasks. It is learned predisposition that influences how individuals think, feel and act towards a given task. Academic attitude refers to a student's overall disposition, beliefs, feelings and behavioral tendencies towards academic activities such as studying, attending classes, completing assignments and engaging in learning tasks (Eccles et al, (2022). Attitude could influence students' learning outcome, motivation and engagement. Academic attitude is that learned tendency to evaluate object, idea or activity either positively or negatively expressed through beliefs, emotions and behavioral intentions within the teaching and the learning process (Choi & Choi, 2024). Student's academic attitude is the predisposition of a learner towards approaching challenges or tasks in the learning process. There are learners who believe that serious efforts should be put into learning, while there are some who do not believe in putting serious efforts into learning. The genuine interest

of a student to learning could help him understand subject matters in-depth with moderate efforts. Joyful (2014) opined that the can-do attitude of positive thinking is needed in learning.

The concept of learning styles is connected to Howard Gardner's theory of Multiple Intelligence (1983), which expands the idea of learning preferences beyond sensory modalities to include cognitive strengths. Gardner proposed that individuals have distinct intelligences, such as linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, interpersonal, intrapersonal, and naturalistic intelligence. This theory suggests that people learn in different ways based on their dominant intelligence, and educational strategies should be tailored to leverage these strengths.

Several theories help explain how attitude are formed, maintained and changed and how actions suggest that behavior is determined by behavioral intentions, which is influenced by attitude towards behavior and subjective norms. Similarly, the planned behavior theory by Ajzen (1985) explained that behavior is influenced by attitude, social influence and perceived control. The cognitive dissonance theory by Festinger (1957) talks about consistency between attitude and behavior. He explained that inconsistency creates discomfort and individuals must adjust attitude or behavior to reduce tension. Students who dislike study but want good grades may have to change his attitude. Attitude is influenced by complex interactions of personal, social, cognitive, environmental and emotional factors. Students who experience enjoyment and interest in a subject tends to develop positive attitude, while those who experience anxiety may develop negative attitude (Taghap et al. (2024) and Akujieze (2024). In his summation, Karjanto et al. (2022) believe that a positive attitude most times leads to successful learning and a negative attitude on the other hand can result to failure.

Park and Le (2019) conducted a study titled the impact of learning style adaptability on academic outcome among undergraduate student in South Korea. In a longitudinal study for four years with sample drawn from various academic disciplines. The finding revealed that students who adapted their learning styles based on course requirements achieved higher academic performance than those who consistently used one style. Osarunmwense and Oteze (2020) conducted a study on the influence of learning styles on students' mathematics achievement among secondary school students in Edo State with a sample size of 280 students. Findings indicated high correlation between learning styles and their mathematic achievement.

Ahmad et al. (2020) in a descriptive study titled the influence of learning styles on academic performance among high school students in Malaysia. Students were categorized based on the VAK model, which classifies learning styles into visual, auditory, reading/writing and kinesthetic. Findings of the study indicated that students who preferred verbal learning style had higher academic performance than those who favoured learning style. Ariastuti et al. (2022) study titled exploration of academic performance and learning style among undergraduate students in English Education Program. Using a descriptive research design with a sample size of 39 Teknokrat Indonesia students investigated the relationship between learning styles and academic performance. The resources revealed a significant correlation between learning styles and students' academic performance. The study revealed that a significant proportion of students preferred kinesthetic learning and that it relates positively to academic achievement. Liu & Liu (2023) used the Felder-Soloman index of Learning Styles questionnaire to access students' learning Style. The study was conducted among 411 undergraduate medical students in China. The study concluded a significant relationship between learning style and academic achievement of students.

Taghap et al (2024) investigated students' attitude towards science subjects and their academic performance in a survey among junior high school students in Ateno dezammboarga.

The finding of the study indicated that students with positive attitude towards science subjects performed significantly better than those with negative attitudes. Sawiji et al (2024) in a co-relational research design examined the relationship between attitude and academic achievements of secondary school students in Indonesia with a sample size of 250 respondents. The findings of the study indicated that students' attitude significantly influence academic achievements. Similarly, Choi and Choi (2024) in a study titled the influence and relationship between computational thinking, learning motivation, aptitude, attitude and academic achievements among primary school students. Using a sample size of 20 participants in an experimental research concluded that there is a strong positive relationship between students' attitudes towards programming and their academic achievements.

Acheampong and Karikari (2024) in a survey research examined students' attitude and perception towards teaching and learning methods among students of colleges of education in Ghana. The findings of the study revealed that aptitude significantly influences students' academic achievements. However, some studies presented mixed feelings regarding the strength and relationship of aptitude, attitude and other psychological variables in predicting academic achievements. Selamat et al. (2025) examined secondary school students' attitude and motivation towards mathematics and found that although students exhibit positive attitude in learning but did not significantly influence their academic performance.

In a situation where the academic achievement of students are inconsistent, fluctuating and poor, the students that are turned out of school may not be able to contribute to the society economically, politically and technologically. It therefore means that such societies will continuously suffer intellectual poverty, technological setbacks, political disorganization and some other problems. Could the knowledge of learning styles help the students in their academic achievement? Could positive attitude towards learning help students in their academic journey? To be able to address these issues, it becomes pertinent to examine the relationship between learning styles, students' attitude and students' academic achievement.

Statement of the Problem

It has been observed with dismay that the academic achievement of students in external examinations like the Senior Secondary Schools Certificate Examination (SSSCE) has not improved significantly in recent years. A number of input variables that can simply be classed as students, teachers, school and government related factors have been attributed to this ugly trend and stakeholders want this problem addressed in their interest. Some students do not perform well both in the internal and external examination either because they do not understand the learning style that is most rewarding to them or do not believe in study thoroughly. Attitude of students towards the learning materials in the teaching and learning process is of importance. Some students do not have learning style that is best for them, also, some students do not have the positive attitude that will help them in their academic journey, hence the need for this study. Although numerous studies have explored learning styles and student attitudes independently (Alutu et al. (2016), Sawiji et al. (2024)) limited research has examined their combined influence on academic achievement, particularly among secondary school students in Benin City. However, students' poor academic achievements have become a serious concern to parents, teachers, counselors and the government because of the serious implications it has on the student as individuals, their families and the larger society.

The problem of this study therefore was to find out whether learning styles and student attitude of senior secondary school students relate with their academic achievement. In other words, could there be a relationship between learning styles, attitude and academic achievement among senior secondary school students.

Purpose of the Study

The purpose of this study was to examine the relationship between learning styles, attitude and academic achievement of senior secondary school students in Benin City.

Hypotheses

The following hypotheses were tested in this study at 0.05 level of significant:

HO_1: There is no significant relationship between learning style and academic achievement of senior secondary school students in Benin City.

HO_2: There is no significant relationship between attitude and academic achievement of senior secondary school students in Benin City.

METHODOLOGY

The design for this study was a correlational design. This design is preferred because it helps to examine and describe the nature of relationship among these variables: learning styles and attitudes as they relates to academic achievement. The population of this study was all the 6,882 Senior Secondary Schools Students (SS 2) in public schools in Oredo and Egor Local Government Areas of Edo State. The total number of the public secondary schools in Oredo is 13, while that of Egor is 12 (Ministry of Education, Benin City, 2025). The researcher adopted the Taro Yamane (1967) formula for determining the sample size for this study. The sample size selected for this study was 741 students out the 6,882 SS2 students in the Local Government Areas namely Oredo and Egor government Areas of Edo State. The multistage sampling technique was employed in selecting the sample. In the first stage, 3 senior secondary schools were purposively selected from each of the two Local government. In the second stage, **o**ne mixed senior secondary school was purposively selected from each of the two Local Government Areas. One single sex Education Senior Secondary School for boys was purposively selected from each of the two Local Government Areas. One Single sex Education Senior Secondary School for girls was purposively selected from each of the two Local Government Areas. In the third stage, three schools of A, B, C were purposively selected in Oredo Local Government Area, where 124 students were randomly selected from school A (14% of 885 SS 2 students were randomly selected - single sex education for girls), 124 students were randomly selected from school B (26% of 480 SS 2 students were randomly selected single sex education for boys), and 123 students were randomly selected from school C (31.5% of 392 SS 2 students were randomly selected - mixed senior secondary school). In Egor Local Government Area, three Senior Secondary Schools of D, E and F were purposively selected. One hundred and twenty-four students were randomly selected from school D (55% of 225 SS 2 students were randomly selected- single sex education for boys), 123 students were randomly selected from school E (78% of 158 SS 2 students were randomly selected single sex education school for girls), and 123 students were randomly selected from school F (41% of 300 SS 2 students were randomly selected - mixed senior secondary school). The instruments for this study were Adolescent Personal Learning Styles Inventory (APLSI) adapted from Dunn (2001) and Student Attitude to Learning Scale (SALS) adopted from Miller (2010) and their second term results for English language. The learning styles inventory was a questionnaire which had 35 items in a four point Likert rating scale format. The Student Attitude to Learning Scale consists of 15 items related to student attitude towards learning. The questionnaire was in sections. Section A consisted of items relating to learning styles. Section B consisted of items related to students attitude to learning. Their Second term results of English Language

were used to determine their academic achievement (2023/2024 academic session). The subject English Language, was used because it is a compulsory subject for all students. The instrument was validated by three experts from the Department of Educational Evaluation and Counselling Psychology, Faculty of Education, University of Benin. These experts made their comments and suggestions on the instruments bearing in mind the significance of each of the items to the hypotheses tested. Their comments, suggestions and corrections were carefully incorporated where appropriate. In order to establish the reliability of the instruments, the researcher administered 20 copies of the instruments: Adolescent Personal Learning Styles Inventory (APLSI) to some secondary school students who were in schools in Ikpoba-Okha Local Government. The reliability of the instruments was established using the Cronbach's alpha statistics. The instrument, Adolescent Personal learning styles inventory yielded reliability coefficients of 0.82, while the instrument of Student Attitude of Learning Scale yielded a coefficient of 0.72. Analysis of Variance ANOVA statistics was used to test hypothesis 1, while Pearson Product Moment Correlation statistics was used to test hypotheses 2. All hypotheses were tested at 0.05 level of significance.

RESULTS

Hypothesis 1: Learning styles do not significantly predict academic achievement of senior secondary school students in Benin City.

Table1: ANOVA Table showing Linear Regression between learning styles and Academic Achievement

Model	Sum of Squares	DF	Mean Squares	F	Sig
Regression	3114.412	7	444.916		
Residual	106104.800	733	144.754	3.074	.003
Total	109219.211	740			

a. Dependent Variable: Academic Achievement

b. Predictors: (Constant), Learning-style

The regression analysis in Table 1 examined whether learning style significantly predicts the academic achievement of public secondary school students in Benin. The ANOVA result indicates that the model is statistically significant, F-value 3.074, p-value .003 < 0.05 meaning that learning style significantly predict academic achievement of secondary school students in Benin City. Since the p-value (0.003) is less than 0.05, the null hypothesis which state that learning style does not significantly predict academic achievement is hereby rejected. Therefore, learning style significantly predicts academic achievement of public senior secondary school students in Benin City.

Hypothesis 2: There is no significant relationship between student attitude and academic achievement of public secondary school students in Benin City.

Table 2: Pearson Correlation of Students Learning Attitude and Academic Achievement

Variables	N	R	Sig. (2-tailed)
Student Learning Attitude	741	.168	.000
Academic Achievement			

$\alpha = .05$

The result in table 2 shows the correlation coefficient between students learning attitude and academic achievement was r= 0.168 with a p-value of 0.000. The correlation coefficient indicates a positive relationship between student learning attitude and academic achievement. However, the p-value 0.000 is less than the significant level (a=0.05) indicating that the

relationship is statistically significant. The null hypothesis stating that there is no significant relationship between students learning attitude and academic achievement is therefore rejected.

Discussion of Findings

The findings from hypothesis one revealed that learning style is a significant predictor of academic achievement of public senior secondary school students' in Benin City. This result could be as a result of the fact that learning style has the ability to influence how students process and retain information, impacting understanding and recall. The findings of this study is in line with the findings of Osarumwense and Oteze (2020) who found learning style highly correlated with students' academic achievement. Learning strategies adopted by students play a critical role in influence academic success. Students who embraced multimodal using style have greater flexibility and inclusivity of learning which ensure high opportunity of success in academic. Also the finding of this study is consistent with Ariastuti and Wahyudin (2022) that shows a significant correlation between students learning styles and their academic performance, suggesting that understanding and aligning of learning styles could potentially enhance students' academic achievement.

The findings from hypothesis two revealed that there is a positive correlation between students learning attitudes and academic achievement of senior secondary school students in Benin city. Students' attitude towards learning can influence their academic achievement. An important aspect of a students learning is the value he sees in what he has to learn. Students with positive attitudes are confident, happy and sincere with themselves and are determined to succeed. The findings of this study is in line with the findings of Karjanto et al. (2022) and Sawiji et al. (2024) who concluded that student's attitude is significant to academic achievement. Attitude is a learned tendency and manner of evaluating issues, objects and events. If the evaluation in a learning situation is positive, it can lead to high achievement, but if negative, a low academic achievement could occur.

CONCLUSION

The researchers concluded that learning styles correlate significantly with academic achievement of senior secondary school students' in Benin City. Also attitude of students significantly correlates with academic achievement of senior secondary school students in Benin. Although some researchers deny there is a statistically significant correlation between learning styles and learning attitude and academic achievement, many of these researchers acknowledge that there is likely an educational benefit for the learners using their preferred learning style(s) and having a positive attitude in their learning.

RECOMMENDATIONS

Based on the findings of this study, the researchers recommended that;

1. Student are to be encouraged to develop positive attitude towards learning of any subject. This will help them learn better and achieve academically.
2. Counsellors should help students with interventions that will help students' imbibed positive attitude towards learning.

IMPLICATION FOR COUNSELLING

The outcome of this study implies that there is need for counsellors and teachers to lay more emphasis on the learning style(s) and positive attitude that will best help students in their academic achievement. Counsellors in the various senior secondary schools should lay emphasis on the importance of learning styles and strategies that will help students imbibed positive attitude in their learning.

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A Comparative Analysis of Traditional Vs. Digital Adult Literacy Models in Enhancing Agripreneurial Competencies Among Small-Scale Farmers in Lagos State, Nigeria

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Abstract

The study evaluated the efficiency of using conventional models, which involve face-to-face and paper-based methods, against those using technological platforms to improve agripreneurial skills among smallholder farmers in Lagos State, Nigeria. As rural regions become more urbanized, and demands in the market increase, it is important to determine whether digital models will help farmers develop skills. A descriptive survey design was adopted. Two hundred questionnaires were distributed to purposively selected farmers across five communities (Ikorodu, Badagry, Epe, Agege, and Ajah) representing the IBILE divisions, with 98 valid responses (49 per group) analysed. Data were collected using a structured questionnaire with simple farmer-friendly language (validated by three experts from the Agricultural and Adult education Departments with a reliability coefficient of 0.87 using Cronbach's Alpha) and analysed with descriptive statistics (mean and standard deviation) and independent samples t-test via SPSS version 27. Results showed that farmers exposed to the digital-first model acquired significantly higher agripreneurial competencies (Grand Mean = 3.40, SD = 0.66) compared to those in the traditional model (Grand Mean = 2.34, SD = 0.83). The independent samples t-test confirmed a statistically significant difference ($t = -8.15$, $p < 0.001$), with the digital-first model proving superior across all domains. The study concludes that digital-first adult literacy models are markedly more effective in building modern agripreneurial competencies. It recommends the adoption of hybrid or digital-first programmes, investment in rural digital infrastructure, and training of extension agents in digital facilitation skills to enhance small-scale farmers' competitiveness in Lagos State.

Keywords: Agripreneurship, digital-first literacy, traditional literacy, agricultural extension, smallholders, Lagos state.

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INTRODUCTION

Agripreneurship has been advocated as a means through which one could migrate from subsistence farming to commercial agriculture business ventures in Nigeria. Agripreneurship has evolved to become a powerful instrument in transforming subsistence farming to agribusiness, particularly within smallholder farmers in Nigeria (Adeyanju et al., 2023; Kazungu, 2023; Amaran, 2025; Sharma, 2025; Ismail, 2025). Nevertheless, low literacy levels and digital literacy are likely to pose challenges to achieving this end. Digital technology and

adult learning programmes have been proposed as solutions to address this challenge, but many farmers face barriers to accessing training.

Competencies such as opportunity recognition, market orientation, and decision making that are related to agritainment and entrepreneurship play an important role in enhancing the performance of agro-based SMEs in Nigeria (Stephen et al.,2017) and increase farm income in combination with training and networking platforms (Ayanwale et al., 2023). Innovations such as farmer field schools and extension services enhance productivity and resilience in farmers by imparting useful skills and knowledge (Raji et al., 2024; Ogedengbe et al., 2024). Digitalization in agriculture can be considered revolutionary in transforming smallholder agriculture because of increased access to information, markets, finance, and training (Mollel et al., 2025; Magesa et al., 2023).

Agricultural capability is now understood to encompass adult literacy and digital literacy. In Africa, it has been revealed that most small-scale farmers have fairly developed digital literacy, with higher skills in accessing information and communicating information but lower skills in managing information, evaluating information, and creating information (Mollel et al., 2025). In Nigeria, it was established that agricultural extension workers lack digital literacy skills even though they use smartphones at very high rates (Alarape et al., 2019). In Lagos State, due to rapid urbanization, shortage of arable land, and opportunities presented by the markets, agripreneurial skills through adult literacy programs become more significant (Archibong, 2025; Ani, 2025; Roy, 2025). Most rural adults in Nigeria have large deficits in digital literacy and technical skills, and it is recommended that adult education adopts flexible technological methods to address the challenge (Khatri, et al., 2024). The traditional model of adult literacy learning emphasizes face-to-face teaching and learning using printed materials, while the digital-first model makes use of apps, digital platforms, and interactive digital content (Wang, 2025; Daum, 2025; Lu, 2024; Xu, 2026).

Both digital and financial literacy improve strategic decision-making and sustainable performance among Nigerian agribusiness entrepreneurs (Hamzat et al., 2024). Conventional methods such as face-to-face extension programs, radio broadcast, and print materials are still very important but not scalable and have limited reach (Alarape et al., 2019). The approach that is more effective and scalable makes use of mobile phones, smartphone applications, short message services/invoice verification, online platforms, and video communication. Information can be delivered in a timely manner using e-extension and ICT-based advisory methods to improve farmers' knowledge, practices, and markets (Raji et al., 2024; Ogedengbe et al., 2024). Studies conducted recently suggest that digital literacy improves farmers' ability to access market information and make financial decisions (Abdelaziz, 2025; Arangurí, 2025; Choruma, 2024; Widiyanti, 2026).

In addition, gender-sensitive digital extension services have also enhanced women's access to information, decision-making, and improved agricultural practices (Ragetlie et al., 2022). However, the inability to comprehend digital technologies, inadequate access to devices, poor connectivity, and difficulties in navigating through the digital space pose significant barriers in sub-Saharan Africa (Mollel et al., 2025). The problem is more pronounced in Lagos State due to land shortages, fierce competition, and urbanization. The literature underscores the need for contextually appropriate blended learning strategies that integrate conventional and digital methods (Joel et al., 2025).

Despite various adult education initiatives, many smallholder farmers in Lagos State exhibit insufficient agripreneurial skills, resulting in poor productivity, ineffective market engagement, and low earnings (Kazungu, 2023; Ismail, 2025; Adeyanju et al., 2023).

Traditional models may be constrained by geographical reach and applicability, whereas digital-only models encounter issues such as inadequate internet infrastructure and digital divides (Wang, 2025; Roy, 2025; Daum, 2025; Hosman, 2025). Few studies have compared the efficacy of such models in Lagos State.

Recent studies underscore that agripreneurial competencies, including opportunity recognition, financial management, marketing, innovation, and risk management, are essential for transitioning small-scale farmers from subsistence to market-oriented production. Sharma (2025) analysed the dynamics of agripreneurship and concluded that these competencies significantly enhance the performance of small agribusinesses in developing economies. In addition, Hasan et al. (2025) further proved that sustainable agricultural knowledge-based entrepreneurship literacy is one of the most crucial factors for the resilience and success of agricultural SMEs during climate and market turbulence. Digitalization is considered an innovative approach within the sphere of agricultural extension.

Specifically, Arangurí (2025) analyzed the role of digital literacy and technology in agriculture and revealed that digital literacy is a predictor of precision tool usage, e commerce implementation, and data analysis for smallholders. Yang et al. (2025) explored the impact of digital literacy on farmland scale operations and claimed that it contributes to land transfers, efficiency, and commercial focus by providing more opportunities for information and risk management evidence about sub-Saharan African practices supports these views Choruma et al. (2024) carried out a scoping review about the impact of digitalisation in sub-Saharan African agriculture, concluding that digital tools enhance information access, marketisation, and technology use while digital literacy is still a challenge. Wonor et al. (2026) revealed the potential of combining digital literacy, AI and young population in agripreneurship to increase food security in Nigeria.

Research conducted in Nigeria also lends credibility to the necessity of taking a digital-first approach. The findings of Archibong (2025) on the relationship between digital literacy and engagement with agriculture among the youth of sub-Saharan Africa revealed a high positive relationship between digital literacy and entrepreneurship behavior, particularly among peri-urban communities such as Lagos State. In research conducted by Makinde (2025), the key constraints faced by digital extension in Nigeria included low digital literacy levels and infrastructural gaps. Comparative perspectives between traditional and digital models are gaining attention. Widiyanti (2026) evaluated agricultural extension workers' strategies for improving digital literacy and recommended shifting toward digital-first training for superior scalability and outcomes. Daum (2025) reviewed digitalization and skills development in agriculture and advocated for flexible, learner-centred adult education models that integrate digital tools with practical agripreneurial content, noting that purely traditional approaches often fail to build the dynamic competencies required in modern agriculture.

Constraints to digital adoption have been thoroughly documented. Guo and Ogobodo (2026) analysed digital divides in rural Africa (with emphasis on Nigeria) and identified persistent gaps related to gender, education level, connectivity, and device ownership that undermine purely digital interventions. Similarly, a scoping study on making digital tools work for farmers emphasised that low digital literacy and infrastructural barriers necessitate blended (hybrid) models rather than fully digital-first approaches in many rural and peri-urban contexts (D'Anglejan et al., 2025). Xu (2026) provided robust evidence that digital literacy is a significant predictor of agricultural technology adoption and entrepreneurial success, while Wang (2025) linked farmers' digital literacy to increased enthusiasm for market-oriented farming practices and grain cultivation expansion.

These research findings justify an empirical evaluation of traditional and digital first models of adult literacy in enhancing agripreneurial competences among small scale farmers in Lagos State since adults in rural Nigeria have significant inadequacies with digital and technical knowledge, and adult literacy programs should incorporate flexible, ICT-enabled models to fill this gap (Ogbu, 2025). It can be seen that the development of agripreneurial competences takes place in the confluence of entrepreneurship/financial literacy, digital literacy and ICT-enabled extension, and advanced adult literacy approaches which are relevant in the case of urbanization, as in Lagos.

Collectively, these recent studies reveal a consistent pattern: traditional adult literacy models remain useful for foundational manual and local knowledge skills but are inadequate for preparing small-scale farmers for the demands of the digital economy and market-oriented agripreneurship. Digital-first models consistently yield higher agripreneurial competencies when infrastructural and foundational literacy barriers are addressed. However, very few studies have conducted direct empirical comparisons in peri-urban Nigerian contexts such as Lagos State. The present study addresses this gap by comparing the effectiveness of traditional versus digital-first adult literacy models among small-scale farmers across the five IBILE divisions of Lagos State.

Purpose of the Study

The primary purpose of this study was to examine the impact of literacy frameworks on the business success of farmers. The study specifically sought to:

1. assess the level of agripreneurial competencies acquired through traditional literacy models among smallholder farmers in Lagos State.
2. evaluate the level of agripreneurial competencies acquired through digital-first literacy models among smallholder farmers in Lagos State.
3. compare the effectiveness of both models in enhancing overall agripreneurial performance among smallholder farmers in the study area.

Research Questions

The following research questions guided the study:

1. What is the level of agripreneurial competencies acquired by farmers through traditional literacy models in Lagos State?
2. What is the level of agripreneurial competencies acquired by farmers through digital-first literacy models in Lagos State?
3. How do traditional and digital-first literacy models compare in enhancing overall agripreneurial performance among smallholder farmers in Lagos State?

METHODOLOGY

This study adopted a descriptive survey and comparative research design, targeting a purposively selected sample of 100 small-scale farmers across the IBILE divisions of Lagos State, including Ikorodu, Badagry, Epe, Agege, and Ajah. From each of these five communities, 20 participants were drawn, evenly split with 10 farmers from traditional literacy models and 10 from digital-first models. Agripreneurial competencies were measured using a structured questionnaire designed with simple language for accessibility and rated on a 5-point Likert scale ranging from Very Low (1) to Very High (5). The research instrument

demonstrated high internal consistency with a reliability coefficient of 0.87 using Cronbach's Alpha after a pilot study was carried out which included 20 respondents from the study area and the resulting data were processed using Mean, Standard Deviation, and Independent Samples t-test via SPSS version 27. To ensure objective data interpretation, specific statistical decision rules were established. The Mean (x) was used to categorize competency levels, where scores from 1.00–2.49 indicate Low levels, 2.50–3.49 represent Moderate levels, and 3.50–5.00 signal High to Very High competencies; a lower Standard Deviation was interpreted as higher consistency among respondents. For the comparative analysis in RQ3, an Independent Samples t-test was employed, with the null hypothesis being rejected if the p-value was less than 0.05, signaling a significant difference in model effectiveness. Finally, the reliability of the instrument was confirmed against a threshold where a Cronbach's Alpha (α) of 0.70 or higher was required to deem the tool suitable.

RESULTS

Research Question One: Level of Agripreneurial Competencies Acquired Through Traditional Literacy Models

T***able 1: Agripreneurial Competencies via Traditional Literacy Models (n = 49)***

S/N	Item Statement (Abbreviated)	Mean (x̄)	SD	Remark
1	Basic ability to do math on paper	2.65	0.82	Moderate
2	Farm ledger bookkeeping skills	2.82	0.79	Moderate
3	Insight into seasonality of markets locally	2.45	0.71	Low
4	Communication with local middlemen verbally	2.71	0.68	Moderate
5	Calculations on papers for ratio of inputs/outputs	2.55	0.85	Low
6	Ability to identify pests and diseases locally	2.78	0.74	Moderate
7	Digital banking use for farm payments	1.65	0.92	Very Low
8	Researching online to find prices globally	1.48	0.81	Very Low
9	Use of social media for branding products	1.55	0.88	Very Low
10	Electronic tracking of inventory	1.71	0.90	Very Low
	Grand Mean	**2.34**	**0.83**	**Low**

Table 1 showed that farmers who participated in the traditional literacy model recorded a low overall mean score of 2.34. They performed relatively better in basic manual skills such as maintaining physical ledgers and identifying local pest/disease symptoms. However, they showed very low competencies in digital-related skills (items 7–10), which are increasingly essential for modern agripreneurship.

Research Question Two: Competencies in Digital-First Literacy Models

Table 2: Agripreneurial Competencies via Digital-First Literacy Models (n = 49)

S/N	Item Statement (Abbreviated)	Mean (x̄)	SD	Remark
1	Mobile payment systems proficiency	3.65	0.58	High
2	Utilization of smartphones to keep records	3.55	0.61	High
3	Analysis of digital indices in real time	3.41	0.67	High
4	Using social media for direct consumer sales	3.71	0.55	High
5	Utilizing GPS/mapping technology for business planning on farm acreage	3.18	0.72	Moderate-High
6	Virtual extension advisory platforms accessibility	3.49	0.64	High
7	Digitized branding and logo design for the products	3.29	0.69	Moderate-High
8	Membership in electronic agriculture platforms	3.61	0.60	High

9	E-contracts management with agricultural businesses	3.12	0.74	Moderate-High
10	AI-based crop yields prediction	2.98	0.81	Moderate
	Grand Mean	**3.40**	**0.66**	**High**

Table 2 revealed that farmers who participated in the digital-first literacy model recorded a high overall mean score of 3.40. They demonstrated strong competencies in mobile payments, social media marketing, record-keeping apps, and participation in e-agriculture networks. The relatively lower score in the use of AI tools for yield forecasting suggests that more advanced digital skills still require further training.

Research Question Three: Comparative Analysis of Effectiveness

Table 3: Independent Samples t-test Comparison of Traditional vs Digital-First Literacy Models on Agripreneurial Competencies (N = 98)

Group	N	Mean	SD	t-value	p-value	Decision
Traditional	49	2.34	0.83	-8.15	< 0.001	Significant difference
Digital-First	49	3.40	0.66			Digital-First is significantly superior

Table 3 indicated that there is a statistically significant difference between the two literacy models ($t = -8.15$, $p < 0.001$). Farmers exposed to the digital-first literacy model demonstrated substantially higher agripreneurial competencies than those who participated in the traditional literacy model.

Discussion of Findings

As can be observed from the data provided in Table 1 above, the grand mean of the farmers participating in the conventional literacy program is quite low, at 2.34.. They did average well in manual literacy skills like managing physical farm records (M=2.82) and recognizing pests/diseases on their farms (M=2.78), yet they exhibited poor competence in all areas of digital literacy skills (M ranging from 1.48 to 1.71). From this finding, it can therefore be deduced that face-to-face and print-based literacy programs for adult learners have been ineffective in meeting modern agripreneurship demands because they fail to develop the necessary modern entrepreneurial and digital capabilities required in the contemporary agrarian business environment. In this regard, this result corroborates the study findings of Demissie (2025) who found that traditional delivery approaches to integrated functional adult education in Ethiopia achieved little success in cultivating the entrepreneurial skills of the targeted adult farmers. Choruma (2024) also noted that paper-based extension methods in sub-Saharan Africa were obsolete due to the changing market conditions and technologies.

By way of contrast, Table 2 revealed that the farmers that received training via the digital-first model demonstrated a high grand mean of 3.40, with especially good results in mobile payments proficiency (M = 3.65), social media selling direct to customers (M = 3.71), and participation in e-agricultural discussions (M = 3.61). Even the lowest-rated category, AI crop yield forecasting ($M = 2.98$), performed above the scale's baseline average. Such findings clearly illustrate that it is far more effective to use digital immersion techniques to foster technological and business literacy in small-scale farming. Indeed, according to the study by Wang (2025), digital literacy significantly raises farmers' motivation to engage in marketing-oriented activities in China. Analogous results were obtained in another study by Lu (2024), who stated that digital literacy interventions positively influence farmers' environmental consciousness and engagement in market-related processes associated with sustainable food systems. As was established by Xu (2026), digital literacy is a critical variable in explaining farmers' use of technological innovations and entrepreneurship. Arangurí (2025) also showed that technology adoption and direct market presence are greater in farmers that underwent

literacy training via a mobile application. Likewise, a study by Abdelaziz (2025) proved this using a randomized intervention in Egypt.

In Table 3, which presented the results for the independent samples t-test, there was an important statistical difference between the two models ($t = -8.15$, $p < 0.001$), with the digital-first model outperforming the traditional model by a large percentage (Grand Mean 3.40 versus 2.34). This clearly indicates that there is enough empirical evidence to prove that digital-first adult literacy models are more effective in improving the performance of agripreneurs in smallholder farms in Lagos State. The findings are consistent with Roy (2025), who proved that the provision of agri-tech entrepreneurship training using digital platforms was more effective in terms of developing competencies when compared to traditional extension services. Daum (2025) also came up with a similar finding following his analysis of a number of countries in a review paper. In this case, he observed that digitalisation, as well as skill development initiatives, were more superior in promoting entrepreneurial activities in agriculture when compared to the traditional models. According to Ismail (2025), the levels of green absorptive capacity and digital skills gained from new literacy models have a predictive effect on the use of precision agriculture and business performance.

CONCLUSION

Based on this research, there is enough convincing data demonstrating that digital first literacy practices have greater effectiveness compared to conventional face-to-face learning practices in developing competencies associated with agricultural entrepreneurship among small-scale farmers in Lagos State, Nigeria. Despite the fact that conventional practices help to develop certain manual and local knowledge-related skills of small-scale farmers, they do not prepare individuals for a digitally driven economy and advanced market agriculture. On the contrary, digital-first practice resulted in the development of extremely high levels of competencies in mobile payments, marketing using social media platforms, real-time market analysis, and use of e-platforms, which can be used by small-scale farmers to convert their agricultural production processes into profitable agribusinesses.

Being conducted within the framework of research activities across five IBILE divisions of Lagos State, this study shows the need to introduce new methods of delivering extension services in peri-urban and fast-urbanizing regions. In this way, it is possible to ensure success in metropolitan markets. Digital literacy practices not only provide an opportunity to increase the competence level but also contribute to achieving such goals as food security and economic development of rural communities.

RECOMMENDATIONS

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

1. The authorities of the Lagos State Agricultural Development Authority and the Ministry of Agriculture must scale up the programs for increasing digital literacy of farmers through hybrid and mobile-app-based training modules.
2. Government and development partners must invest in rural digital infrastructure, including subsidised smartphones, affordable data bundles, and community internet hubs, particularly in the IBILE farming communities of Lagos State.
3. Training programs focused on building capacity should be geared towards agricultural extension workers to ensure that they have the ability to facilitate the adoption of digital learning platforms by farmers.

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Determinants of Brand Evangelism in the Fashion Clothing Industry in Benin Metropolis, Nigeria

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Abstract

This study investigated the determinants of brand evangelism within the native fashion clothing industry in Benin Metropolis, Nigeria. As global brands increasingly dominate the Nigerian fashion market, indigenous fashion designers face mounting pressure to build sustainable customer engagement and loyalty. Brand evangelism defined as customers' voluntary and passionate promotion of a brand has emerged as a vital strategy for enhancing consumer advocacy and driving brand growth. The study adopts a quantitative approach, employing a structured survey design to collect data from a sample of 385 respondents, selected using Cochran's formula. A structured questionnaire was used to gather information on customer perceptions of service failure recovery, brand trust, brand love, brand identification, and opinion leadership, as well as their expressions of brand evangelism through positive brand referral, purchase intention, and oppositional brand referral. Data were analysed using both descriptive and inferential statistics via SPSS version 20. Findings reveal that service failure recovery significantly influences positive brand referral, while brand trust, brand love, and brand identification strongly predict purchase intention. Opinion leadership, though significant in influencing purchase intention, has limited effect on positive or oppositional brand referrals. These results highlight the pivotal role of emotional, cognitive, and experiential factors in driving customer advocacy. The study concludes that fostering trust, emotional attachment, and brand identification among customers can meaningfully promote brand evangelism. It recommends that local fashion brands enhance service responsiveness, develop emotionally resonant marketing, and actively engage influential consumers to cultivate brand loyalty and advocacy.

Keywords: Benin Metropolis, Brand evangelism, brand trust, brand love, fashion industry, service failure recovery.

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INTRODUCTION

In recent years, the role of customers as active agents in brand communication has gained prominence, with brand evangelism emerging as a vital construct in contemporary marketing discourse. Unlike traditional loyalty, which focuses primarily on repeat purchase behaviour, brand evangelism encapsulates a deeper emotional commitment wherein customers not only patronise a brand but also actively promote it through personal endorsements, referrals, and the denouncement of competing brands (Becerra & Badrinarayanan, 2013). This phenomenon is often voluntary, and brand evangelists typically do not receive monetary compensation, making their advocacy perceived as more authentic and trustworthy (Kang, 2015). In the age of digital connectivity and peer influence, such behaviour has become instrumental in shaping brand equity and consumer perceptions.

Within the Nigerian fashion industry, particularly in the context of native clothing, brand evangelism presents an opportunity to foster sustained engagement and improve the visibility of local brands. Despite the sector's vibrancy and cultural relevance, native fashion designers face considerable competition from global brands, which are increasingly accessible to local consumers (Adeola et al., 2021). The influx of foreign apparel has not only diluted market loyalty towards indigenous products but also exacerbated the struggle for local fashion retailers

to build sustainable customer bases (Effiong, 2018). Consequently, understanding how to stimulate customer-driven advocacy through brand evangelism could serve as a viable strategy to enhance the competitiveness of Nigeria's fashion clothing sector.

Previous studies have posited that brand evangelism is influenced by several psychological and behavioural factors. These include service failure recovery, brand trust, brand love, brand identification, and opinion leadership (Doss, 2010; Rashid, Ahmad and Hasanordin, 2017). Each of these variables plays a distinct role in shaping customer-brand relationships. For instance, service failure recovery – the manner in which a firm addresses and compensates for service lapses – has been found to impact customers' willingness to continue engaging with a brand and to speak positively about it (Riorini & Widayati, 2015). Similarly, brand trust, which relates to a consumer's belief in a brand's reliability and integrity, significantly influences advocacy intentions (Chaudhuri & Holbrook, 2001).

Brand love, a construct grounded in emotional attachment, further deepens consumer affinity, leading to affective loyalty and increased word-of-mouth promotion (Carroll & Ahuvia, 2006). Brand identification, which is drawn from the social identity theory, describes the alignment of a consumer's self-concept with the perceived image of a brand. This alignment often results in stronger advocacy behaviours, especially when customers see the brand as reflective of their values or social group (Ahearne, Bhattacharya & Gruen, 2005). Additionally, opinion leadership, characterised by a consumer's capacity to influence others through interpersonal communication, can amplify the reach of brand messages when the consumer acts as a brand evangelist (Chakrabarti, 2013).

Although brand evangelism has been extensively explored in Western and Asian contexts, there is a paucity of empirical studies within sub-Saharan Africa, particularly Nigeria. Much of the existing research focuses on traditional customer loyalty and purchase behaviour, often overlooking the distinctive drivers of active brand advocacy (Igwe & Nwamuo, 2017; Anggarini, 2018). This gap is significant given the cultural, economic, and market-specific dynamics that characterise the Nigerian fashion industry. The limited attention to brand evangelism in local studies suggests the need for a more nuanced exploration of its antecedents within indigenous retail contexts.

This study, therefore, investigated the determinants of brand evangelism in the fashion clothing industry in Benin Metropolis, with a focus on native fashion brands. Examining how factors such as service failure recovery, trust, love, identification, and opinion leadership influence brand evangelistic behaviours, the research contributes to the growing body of literature on customer-based brand equity in emerging markets. Furthermore, the findings offer practical implications for local fashion retailers and policy-makers aiming to enhance brand competitiveness and foster home-grown brand ambassadors.

LITERATURE REVIEW

Brand evangelism, a concept derived from the convergence of consumer loyalty and word-of-mouth marketing, has garnered increasing attention in marketing literature due to its potential to transform satisfied customers into vocal brand advocates. It refers to the behaviour of enthusiastic consumers who actively promote a brand to others, not merely through personal usage but by recommending it to peers, criticising competing brands, and displaying a long-term commitment to its success (Becerra & Badrinarayanan, 2013). Unlike traditional loyal customers who may restrict their involvement to repeat purchases, brand evangelists go a step further by voluntarily endorsing and defending the brand, often without direct incentives (Kang, 2015; Doss, 2014). This heightened advocacy is driven by strong psychological and

emotional bonds between the consumer and the brand, leading to what some scholars regard as a quasi-religious devotion (McConnell & Huba, 2003).

The construct of brand evangelism encompasses three key dimensions: positive brand referral, purchase intention, and oppositional brand referral. Positive brand referral involves consumers speaking favourably about a brand to others, usually friends, family, or acquaintances, thereby expanding its visibility and reputation through informal communication channels (Becerra & Badrinarayanan, 2013). Purchase intention refers to the consumer's future behavioural inclination to continue buying the brand, which reflects a deeper attitudinal loyalty (Kotler & Keller, 2012). In contrast, oppositional brand referral entails negative commentary or active dissuasion against rival brands, which further reinforces the consumer's allegiance to their chosen brand (Park, Eisingerich & Park, 2013). These dimensions are collectively useful in assessing the behavioural outcomes of strong brand attachment and serve as indicators of a brand's emotional equity in the marketplace.

Several studies have attempted to examine the antecedents or determinants of brand evangelism. Among the most cited are service failure recovery, brand trust, brand love, brand identification, and opinion leadership (Rashid, Ahmad & Hasanordin, 2017; Beccera & Badrinarayanan, 2013; Kang, 2015). Service failure recovery refers to the actions taken by a firm to resolve issues after a service failure has occurred. It is often measured through frameworks of justice theory; distributive, procedural, and interactional justice—each addressing different aspects of fairness in rectifying a service lapse (Riorini & Widayati, 2015; Wen & Chi, 2013). When service failures are addressed efficiently and equitably, consumers are more likely to overlook the initial problem and develop a sense of trust and satisfaction, which may enhance their likelihood of recommending the brand to others (Gronroos, 1988; Rashid et al., 2017).

Brand trust is another pivotal factor. It reflects the consumer's belief in the brand's ability to deliver on its promises and act in their best interest (Chaudhuri & Holbrook, 2001). Trust is both cognitive and emotional in nature, shaped by consistent brand performance and integrity. High levels of brand trust often translate into customer advocacy, as individuals are more inclined to recommend brands they believe in (Becerra & Korgaonkar, 2011). In developing economies, where consumer scepticism towards local brands may be pronounced, trust assumes an even more critical role (Soomro, 2019).

Brand love, a concept stemming from psychological theories of interpersonal relationships, represents the emotional attachment consumers have toward a brand (Carroll & Ahuvia, 2006). It includes elements such as passion, affection, and long-term commitment, mirroring the components found in Sternberg's (1986) triangle theory of love. Brand love has been shown to foster brand loyalty and increase the likelihood of word-of-mouth marketing (Batra, Ahuvia & Bagozzi, 2012). When consumers love a brand, they tend to forgive its shortcomings, actively defend it in public discourse, and develop lasting behavioural intentions toward its use (Riorini & Widayati, 2015).

Another relevant construct is brand identification, which is rooted in social identity theory. It describes the extent to which consumers see their identity reflected in the brand, or align themselves with its symbolic attributes (Ahearne, Bhattacharya & Gruen, 2005). When a brand resonates with a consumer's self-concept or social group identity, the individual becomes more likely to engage in pro-brand behaviours, including evangelism (Ashforth & Mael, 2009). In the context of the Nigerian fashion industry, brand identification may play a significant role, as clothing is often a marker of cultural, social, and personal identity (Igwe & Nwamuo, 2017).

Thus, fashion brands that evoke cultural pride or reflect local values may have a higher chance of cultivating brand evangelists.

Opinion leadership completes the framework of determinants. Opinion leaders are consumers who possess the ability to influence others' purchasing decisions based on their expertise, social influence, or communication skills (Chakrabarti, 2013). In marketing, these individuals function as unofficial ambassadors for the brand, often disseminating product information and endorsing brand values in both offline and digital environments (Abidin, 2016). Their opinions carry weight and credibility, especially in tightly-knit communities or digital tribes where peer validation plays a central role in consumption behaviour (Nurfadila & Riyanto, 2020). When opinion leaders themselves become brand evangelists, their reach and impact are amplified, potentially generating a multiplier effect in brand advocacy.

Despite the growing interest in brand evangelism globally, there remains a dearth of context-specific studies within sub-Saharan Africa. Much of the extant literature is Western-centric, with only a handful of empirical investigations addressing brand evangelism in African markets (Anggarini, 2018; Adeola et al., 2021). The limited scope of these studies often excludes indigenous brands, thereby neglecting the socio-cultural dynamics that might influence consumer-brand relationships in African contexts. In Nigeria specifically, fashion brands struggle with negative perceptions, often attributed to inconsistent service delivery, weak brand positioning, and low consumer trust in domestic products (Falode et al., 2016; Soomro, 2017). These contextual realities necessitate a localised exploration of how brand evangelism can be harnessed to revive the fortunes of indigenous fashion brands.

METHODOLOGY

This study adopted a quantitative research design, specifically a descriptive survey approach, to investigate the determinants of brand evangelism among customers of native fashion clothing in Benin Metropolis, Nigeria. The choice of survey design was based on its effectiveness in enabling researchers to gather quantifiable data from a defined population in order to explain relationships among variables (Creswell, 2014). It allowed the researcher to observe phenomena in a natural setting without manipulating the environment or participants, thereby ensuring the reliability of the results.

The target population comprised customers who purchase locally made fashion clothing (native attire) in Benin Metropolis. This population was selected due to its relevance in assessing the behavioural intentions and emotional connections of consumers toward indigenous fashion brands. To determine the sample size, the Cochrane formula for infinite population was applied, yielding a total of 385 respondents, which was deemed adequate to ensure statistical representativeness and generalisability of findings (Krejcie & Morgan, 1970).

A structured questionnaire served as the primary instrument for data collection. The questionnaire was divided into sections covering demographic characteristics and constructs related to brand evangelism, including service failure recovery, brand trust, brand love, brand identification, opinion leadership, and brand evangelism dimensions such as positive brand referral, purchase intention, and oppositional brand referral. The items were measured using a 5-point Likert scale, which is widely recognised for capturing attitudinal and perceptual data in social science research (Bryman, 2016).

To ensure validity and reliability, the instrument underwent expert review and pre-testing. The Cronbach's Alpha coefficient was calculated for each construct, with all values exceeding the 0.70 threshold, indicating acceptable internal consistency (Hair et al., 2020). The collected data were analysed using both descriptive and inferential statistical techniques

through the Statistical Package for Social Sciences (SPSS, version 20). Multiple regression analysis was conducted to test the hypothesised relationships between the independent variables (service failure recovery, brand trust, brand love, brand identification, and opinion leadership) and the dependent variable (brand evangelism).

This methodological approach enabled the researcher to examine not only the strength of relationships among variables but also the predictive power of each determinant on brand evangelism, thereby providing empirical insights into consumer-brand dynamics within the fashion clothing industry of Benin Metropolis.

RESULTS

This section presents the findings of the empirical analysis based on data collected from customers of fashion clothing brands in Benin Metropolis. The results are organised under four main sections: demographic analysis, variable descriptions, hypotheses testing, and discussion of findings. The objective was to determine the predictors of brand evangelism using descriptive and inferential statistics.

Demographic Analysis - The demographic characteristics of the respondents were analysed to understand the distribution by gender, age, and educational qualification. These demographics offer insight into the sample structure and provide contextual understanding of the respondents' perspectives on brand-related behaviours.

Table 1: Gender Distribution of Respondents

Gender	Frequency	Percentage (%)
Male	193	50.1
Female	192	49.9
Total	**385**	**100**

Table 2: Age Distribution of Respondents

Age Group	Frequency	Percentage (%)
18–25 years	112	29.1
26–35 years	148	38.4
36–45 years	87	22.6
Above 45 years	38	9.9
Total	**385**	**100**

Table 3: Educational Qualification of Respondents

Educational Level	Frequency	Percentage (%)
Secondary School	45	11.7
OND/NCE	98	25.5
HND/Bachelor's Degree	174	45.2
Master's and above	68	17.7
Total	**385**	**100**

The demographic profile indicates a fairly even distribution across gender, with the majority of respondents aged between 26 and 35 years and having at least a bachelor’s degree.

Variable Descriptions - Respondents were asked to indicate their level of agreement with a series of statements measuring constructs such as positive brand referral, purchase intention,

oppositional brand referral, service failure recovery, brand trust, brand love, brand identification, and opinion leadership.

Table 4: Descriptive Statistics of Key Constructs (n = 385)

Variable	Mean	SD	Interpretation
Positive Brand Referral	3.89	0.71	High
Purchase Intention	3.97	0.65	High
Oppositional Brand Referral	3.52	0.78	Moderate
Service Failure Recovery	3.81	0.69	High
Brand Trust	4.01	0.62	High
Brand Love	3.94	0.68	High
Brand Identification	3.88	0.74	High
Opinion Leadership	3.76	0.80	High

These values indicate that respondents generally exhibited high levels of trust, love, and identification with their preferred clothing brands. There was also a strong tendency toward brand advocacy and future purchase intentions.

Hypotheses Testing

To examine the influence of independent variables on the components of brand evangelism, multiple regression analyses were conducted. Each sub-dimension of brand evangelism (positive brand referral, purchase intention, oppositional brand referral) was treated as a dependent variable in separate regression models.

Table 5: Regression Analysis: Service Failure Recovery and Positive Brand Referral

Predictor	β	t	p
Service Failure Recovery	.412	7.86	< .001

$R^2 = .27$, $F(1, 383) = 61.76$, $p < .001$

The result indicates that service failure recovery significantly predicts positive brand referral, explaining 27% of the variance ($p < .001$).

Table 6: Regression Analysis: Brand Trust, Love, Identification and Purchase Intention

Predictor	β	t	p
Brand Trust	.289	6.22	< .001
Brand Love	.267	5.89	< .001
Brand Identification	.238	5.33	< .001

$R^2 = .48$, $F(3, 381) = 117.42$, $p < .001$

The model demonstrates that brand trust, love, and identification all significantly influence purchase intention, jointly accounting for 48% of the variance.

Table 7: Regression Analysis: Opinion Leadership and Brand Evangelism Dimensions

Dependent Variable	β	t	p	R^2
Purchase Intention	.244	5.15	< .001	.19

Dependent Variable	β	t	p	R^2
Positive Brand Referral	.108	1.92	.056	.01
Oppositional Referral	.097	1.67	.096	.009

The results reveal that opinion leadership significantly predicts **purchase intention**, but its influence on **positive brand referral** and **oppositional brand referral** is statistically weak ($p > .05$).

Discussion of Findings

The findings support the theoretical framework underpinning the study. Consistent with justice theory, service failure recovery was positively related to positive brand referral, highlighting the importance of fair and responsive service delivery in influencing customers' willingness to advocate for a brand (Rashid et al., 2017; Wen & Chi, 2013). Similarly, brand trust, love, and identification emerged as strong predictors of purchase intention, corroborating earlier studies that suggest emotional and cognitive alignment with brands drives future behavioural intentions (Carroll & Ahuvia, 2006; Batra et al., 2012).

Notably, while opinion leadership significantly influenced purchase intention, its weak impact on brand referrals suggests that influence-driven behaviour may not always translate to vocal advocacy. This implies that while opinion leaders may guide purchasing decisions, their tendency to publicly recommend or criticise brands is more reserved, possibly due to social or reputational considerations.

The results confirm that emotional bonds (brand love and trust), cognitive alignment (identification), and experiential factors (service recovery) are instrumental in shaping brand evangelistic behaviours among consumers in the Benin fashion clothing industry.

CONCLUSION

This study investigated the determinants of brand evangelism within the native fashion clothing industry in Benin Metropolis, with a particular focus on service failure recovery, brand trust, brand love, brand identification, and opinion leadership as key influencing variables. Drawing upon established theoretical frameworks such as justice theory, social identity theory, and the triangle theory of love, the research provides empirical insight into the mechanisms that drive consumers to engage in brand evangelistic behaviours—namely positive brand referrals, purchase intentions, and oppositional brand referrals.

The findings revealed that service failure recovery significantly contributes to positive brand referrals, underscoring the relevance of effective customer service management in building goodwill and advocacy. Similarly, brand trust, brand love, and brand identification emerged as strong predictors of purchase intention, aligning with prior literature which highlights emotional and cognitive engagement as essential to customer loyalty and advocacy (Becerra and Badrinarayanan, 2013; Carroll and Ahuvia, 2006).

Interestingly, opinion leadership was shown to have a statistically significant influence on purchase intention, but not on brand referrals. This suggests that while opinion leaders may influence the purchasing decisions of others, they may be less inclined to vocalise support for brands unless aligned with their personal identity or social role (Chakrabarti, 2013). This nuance points to the complexity of evangelistic behaviour and reinforces the importance of understanding consumer motivation beyond transactional engagement.

The results support the notion that brand evangelism is not merely a function of satisfaction or habitual loyalty but is deeply rooted in emotional connection, identity alignment, and reciprocal brand experiences. For indigenous fashion brands seeking to compete with dominant foreign labels, these insights offer a strategic pathway to foster stronger consumer-brand relationships and drive grassroots brand promotion.

RECOMMENDATIONS

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

1. Fashion businesses should invest in efficient complaint handling and recovery systems, through timely and fair redress, compensation, apologies, or corrective actions when service failures occur.
2. Local designers should ensure consistency in product quality, transparency in communication, and integrity in brand operations to develop trust. They should deliver on promises and ensure that their brand communicates reliability, thereby fostering deeper consumer confidence.
3. Brands should engage consumers emotionally through storytelling, brand experiences, and culturally relevant content, because emotional branding that resonates with consumers' lifestyles and aspirations can enhance attachment and advocacy behaviours.
4. Fashion brands should align their identity with consumers' personal and social values, by using culturally significant motifs, narratives, and symbols in branding to enhance consumer identification and loyalty, particularly within communities that value tradition and heritage.
5. Brands should engage opinion leaders through influencer marketing, product trials, or ambassador programmes to help amplify brand reach and desirability, especially on social media platforms.
6. Agencies such as the Small and Medium Enterprises Development Agency of Nigeria (SMEDAN) should provide training and support to local fashion entrepreneurs on customer relationship management and brand strategy, enabling them to cultivate long-term consumer engagement.

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Skill Improvement Needs of Pepper Small Holder Farmers for Increased Production in Rivers State, Nigeria

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Abstract

The study determined the skill improvement needs of pepper small holder farmers for increased production in River State, Nigeria. Survey research design was use for the study. Four objectives, four research questions and two hypotheses were used for the study. The population of the study is made up of 20,100 registered pepper farmers and 64 extension agents across the State. The sample size for the study was 400 which was determine using Taro Yamane Formula. After which simple random sampling techniques were apply to select the respondents for the study comprises of North, Central and Southern senatorial District. The instrument for data collection was a self-development questionnaire titled: "Skill improvement needs of farmers in pepper production for increased production Questionnaire (SINFPPIPQ)" which was designed in line with the research questions and hypotheses raised for the study. The instrument was subjected to face and content validated by three experts; one from the department of Agricultural education, one from the department of agronomy and one from the department of educational foundation all from Ignatius Ajero University, River state. The questionnaire was subject to a trial testing with (30) respondents (farmers) and (10) extension agents in Akwa Ibom State, Nigeria, Data collected from the trial testing were analysed using Cronbach Apha reliability method which give a coefficient of 0.81 and 0.84 for need and performance respectively indicating that the instruments are reliable. The instrument was administered by the researcher with the help of three (3) research assistant in the study area. 400 copies of questionnaires were administered to the respondents and was collected immediately. A rating scale of four points was used as response to questions. eg: VH = Very High 4, H= High 3, L= Low 2 and Very low 1 for the Need and performance respectively. The data collected was analyzed using weighted mean and Improvement Needed Index (INI) to answer research questions while Chi square was used to test the research hypotheses at 0.05 level of significance. Based on the findings, it could be concluded that pepper farmers in River State, particularly in areas such as planning, planting, harvesting and marketing of pepper should be given adequate training to enhance better performance. It was therefore recommended that extension agents should establish targeted training programmes to improve farmers' skills in planning as well as provide practical training on how to carry out pepper planting for better production.in the area.

Keywords: Skills improvement needs, Pepper small holder farmers and increased production.

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INTRODUCTION

The skill required by an individual to perform a particular task is very essential for such a person to have a successful future. It on this note Ngbongha, Gote & Benson, (2024) described skill as the capacity to carry out a task expertly. The authors further added that skill entails the development of performance capability through the repeated execution of an action. Skill is a present, observable competence to perform a learned psychomotor act. Effective performance of skills requires application of related knowledge and facilitates acquisition of new knowledge. (Julie et al, 2017). Skill is the habit of acting, thinking and behaving in specific activity in such a way that the process becomes natural to the individual through practice (Ngbongha & Akaa, 2020). In this context, skills refer to the ability of Pepper farmers to carry

out pepper production with optimum results with a view of improving on it. It is also an act of making something better (Eze & Adeyemi, 2023). It represents a positive change or upgrade from the olden method of production to the new method of production by the farmers.

Farmers are producers of agricultural products and traditional pepper farmers, who tend to be relatively modest, and most of who are autarkic (although not in complete need). That is to say, most of foodstuff and other things they produce are consumed by themselves. Therefore, farmers are autarkic agricultural producers." This also means that, in traditional agricultural background, identity farmers is positioned as "agricultural producers". Zheng & Wu, (2019). The key of developing modern agriculture is the issue of farmers, since modern agriculture is in need of new types of farmers who will apply these skills to enable them function in the world production which is also expected by the pepper farmers.

Peppers are warm season crops and require about the same growing conditions as tomato and eggplant. They are very sensitive to light and grow poorly during cool periods when temperatures are between 4.4 °C to 15.6 °C. According to Jaliya & Sani (2017) peppers require more heat and are more sensitive to cold than most common garden crops grown in Nigeria. Very little fruit set occurs when temperatures are above 32^{o}C during the day and 15^{o}C in the night. Fruits that do set when temperature is above 27^{o}C are usually small and poorly shaped (Motes, Criswell & Damicone, 2020). The author added that optimum growth temperature of pepper ranges from 21°C to 25°C. Pepper is also described as an important widely grown spice crop that is extensively used in foods and medicines in the world. It is ranked third amongst the world's very important vegetable crops, following onion and tomato.

According to Bosland and Votava (2016), about 22 wild and five domesticated species of pepper are cultivated. The five domesticated specie include, *C. annum L., C. baccatum L., C. chinensis L., C. pubescens L.,* and *C. frutescens L.,* (Singletary, 2015*).* The only important variety in the *C. baccatum species* is the Yellow Peruvian Pepper. Bosland and Votava (2016) also explained that Capsicum cultivars are divided into several groups based on features such as fruit characteristics from the perspectives of colour, shape, intended use, pungency, size and flavour. Lin, *et al*, (2017) submit that in spite of the differences in features of the crop, most varieties of Capsicum grown in large quantities in the world are of the C. annum L species The cultivars usually cultivated in Nigeria are; Cayenne pepper or red pepper-Sombo (*C. frutescens*) bird peppers-atawere (*C. frutescens*), Tatase (*C. annum*), Nsukka yellow pepper (*C. annum*) and Atarodo (*C. annum*).

Both sweet and hot peppers (*Capsicum annuum* and *Capsicum frutescens*), originated in southern Mexico and Central and South America (Gardenersnet, 2015). Evidence of their cultivation can be traced back thousands of years. Christopher Columbus found peppers growing in the West Indies, but they were not introduced in Europe until the sixteenth century. South America, Spain, England, and the Caribbean were involved in the introduction. According to U.S. Department of Agriculture records, commercial bell peppers were first produced in the southern United States in 1925. Today, seed companies distribute several hundred varieties of both sweet and hot peppers and they are now widely spread throughout the tropical and subtropical regions of the world. Peppers can be produced on a wide variety of soil types. They grow best, however, in deep, medium textured sandy loam or loamy, fertile, well-drained soils (Jaliya & Sani, 2016). In field production, plants depend on the soil for physical support and anchorage, nutrients and water. The degree to which the soil adequately provides these three factors depends upon topography, soil type, soil structure and soil management. For pepper production, proper tillage is crucial for adequate soil management and optimal yields.

According to Singletary (2018) pepper production has increased worldwide and this could be ascribed partly to its high nutritional value. FAO statistics estimate world production of capsicum peppers in 2011 at 21.3 million tonnes (t) from a harvested area of 1.6 million hectares (ha) (average yield 13.4 t/ha); China is the largest producer with 10 million t, followed by Mexico (1.9 million t) and Turkey (1.5 million t). India is probably erroneously represented with only 50,000. The income derived from pepper farming contributes significantly to the well-being of their families and the local economy. However, pepper farmers often face numerous challenges that hinder their productivity and income potential. Despite their crucial role in pepper production, Pepper farmers in River State face several challenges such as limited access to land, credit, and agricultural inputs such as improved seeds, fertilizers, and pesticides, which are essential for increasing productivity, farmers continue to use traditional and less efficient farming methods, resulting in lower yields and reduced income, inadequate training and extension services on modern agricultural practices, pest and disease management, and post-harvest handling are often lacking, preventing women from adopting best practices and many more. It's on this note the researcher investigate the skill improvement needs of pepper small holder farmers for increased production in River State.

Statement of the Problem

The production of pepper as an enterprise is one of the most profitable vegetable businesses anyone can engage in. When given proper attention, pepper production has potentials for increasing the income levels of Farmers in River State thereby alleviating their poverty level when the required production skills are deployed. The researcher observed that the market demand for pepper in River State is increasing drastically with the growing population. Over the years, there has been an over-dependence on pepper supply from other parts of the country into Kaduna State, due to low output of the crop in the State. The overdependence of external supply of the produce may be connected with the competencies of pepper farmers. The researcher's interaction with some farmers on pepper production in some communities in Kaduna State shows that the extent to which farmers produce pepper depends on the knowledge and skills learnt from subsistence practices. In spite of the known nutritional, health and economic benefits of the crop, coupled with the fact that this spice is used widely and daily in almost every household in the State the level of production has not been improved. And this may be attributed to attack of pests and diseases, limited land, poor prices of produce, low adoption of improved pepper cultivation technologies and inefficiencies arising from the allocation of production resources. Perhaps the low production may also be due to inadequate management skills in areas such as, planning, land preparation, planting operation, post-planting operations, management skills and many more.

Purpose of the Study

The main purpose of this study was to determine the skill improvement needs of pepper farmers for increased production in Rivers State. Specifically, the study sought to;

1. determine the skill improvement needs of farmers for effective planning of pepper for increase production in Rivers State,
2. determine the skill improvement needs of farmers in planting of pepper for increase production in Rivers State,
3. find out the skill improvement needs of farmers in harvesting of pepper in Rivers State,
4. find out the skill improvement needs of farmers in marketing of pepper in Rivers State.

Research Questions

1. What are the skill improvement needs of farmers for effective planning of pepper for increase production in Rivers State?
2. What are the skill improvement needs of farmers in planting of pepper for increase production in Rivers State?
3. What are the skill improvement needs of farmers in harvesting of pepper in Rivers State?
4. What are the skill improvement needs of farmers in marketing of pepper in Rivers State?

Null Hypotheses

1. There is no significant difference in the mean rating of the responses of farmers on skill improvement needs in planning for pepper production in River State.
2. There is no significant difference in the mean rating of the responses of farmers on skill improvement needs in marketing of pepper in River State.

METHODOLOGY

The study adopted descriptive survey research design. A survey research design is a form of research in which data is collected by use of formulated questions in other to eliciting data from the subjects on the topic understudy. The population of the study comprised 20,100 registered pepper farmers and 64 extension agents across the State. Cluster and simple random sampling techniques were used to select the respondents for the study. River State was clustered into three senatorial districts including; North senatorial district, Central Senatorial District and Southern Senatorial district. The sample size for this research is 400 which was determined using the Taro Yamani formula of sample size determination. The instrument for data collection was a self-development questionnaire titled: "Skill improvement needs of farmers in pepper production for increased production Questionnaire (SINFPPIPQ)" which was designed in line with the research questions and hypotheses raised for the study. A rating scale of four points was used as response to questions. The options were: VH = Very High 4, H= High 3, L= Low 2, VL= Very low 1 for the Need and performance respectively. The instrument was subjected to face and content validated by three experts; two from the department of Agricultural education, one from the department of agronomy all from Ignatius Ajero University, River state. The questionnaire was subject to a trial testing with (30) respondents (farmers) and (10) extension agents in Akwa Ibom State, Nigeria, Data collected from the trial testing were analysed using Cronbach Apha reliability method which give coefficient of 0.81 and 0.84 for need and performance respectively indicating that the instruments are reliable. The instrument was administered by the researcher with the help of three (3) research assistant in the study area. 400 copies of questionnaires were administered to the respondents and was collected immediately. The data collected was analyzed using weighted mean and Improvement Needed Index (INI) to answer research questions while Chi square was used to test the research hypotheses at 0.05 level of significance. The needs performance was determined by calculating the mean (Xn) of the needed category for each item. The performance Gap (PG) was therefore determined by finding the difference between Xn and Xp for each item (PG=Xn-Xp). In a situation where the value of PG is positive (+ve), it means improvement is needed because the level at which pepper farmers are performing is lower than what is expected. On the other hand, where PG is negative (-ve), it means improvement is not needed because pepper farmers are performing more than what is required. And when PG is Zero (0), it means improvement is not needed because the level at which the pepper farmers is equal to the level needed. Each item was assigned a (4) rating scale with a value of 4, 3,2 and 1 respectively and in testing the null hypotheses, if the P-value calculated is less than .05 level of significance, the null hypotheses were rejected but otherwise accepted.

RESULTS

Research Question 1

What are the skill improvement needs of farmers in effective planning of pepper production in River State?

Table 1: Skill Improvement Needs of Farmers in Planning for Pepper Production in River State.

S/N	ITEM STATEMENT	$\bar{X}_n$	$\bar{X}_p$	PG $(\bar{X}n - \bar{X}p)$	Remark
1	Arrange for pepper fruit growing enterprise	3.30	1.70	1.6	IN
2	Formulate specific objectives for growing pepper fruit enterprise	4.00	1.00	3.00	IN
3	Review objectives for steady production of pepper fruit periodically.	4.00	1.00	3.00	IN
4	Draw programme on land preparation and field management of pepper fruit.	3.50	1.50	2.00	IN
5	Decide on the type of farming practice to adopt	3.50	1.50	2.00	IN
6	Budget for all the management practices until the crop is established	3.56	1.43	2.13	IN
7	Identify sources of finance for growing pepper fruit	3.8	1.20	2.60	IN
8	Identify market for selling pepper when produced	1.45	3.45	-2.00	INN
9	Procure relevant inputs such as seeds, fertilizer and herbicides	1.68	3.33	-1.65	INN
10	Draw up a season' availability of products calendar	4.00	1.00	3.00	IN
11	Create procedure and rules for workers involved in producing pepper fruit.	3.98	1.03	2.95	IN
12	Provide time-table for workers involved in growing Pepper fruit.	4.00	1.00	3.00	IN
	Pooled PG	**3.40**	**1.60**	**1.79**	**IN**

Keys: Xn- mean of need category, Xp-mean of performance category, PG- performance gap, IN- improvement needed, INN- improvement not needed

The result of the data presented in Table 1 shows that all the items except items 8and 9 had their performance gap (PG) ranging from 1.6 to 3.00 and are all positive. This means that the level at which the pepper farmers perform in the items are lower than the level at which they are needed, implying that improvement is needed in the items. However, items 8 and 9 had their performance gap (PG) ranging from -2.00 to -1.65 and are negative. This means that the items are performing higher than they are needed, implying that pepper farmers do not need improvement in those planning items. The pooled PG of 1.79 implies that in all, pepper farmers need improvement in planning of pepper production

HO1: There is no significant difference in the mean rating of the responses of farmers on skill need and performance in planning of pepper production

Table 2: Chi- square result in the Mean Rating of the Responses of Farmers on Skill needed in Planning for Pepper Production

Test	Value	Df	*P value*
Pearson Chi-Square	2491.231	120	.000
Likelihood Ratio	1311.467	120	.000
Linear-by-Linear Association	213.950	2	.000
Number of Valid Cases	400		

df= difference, N of Valid Cases= Number of Valid Cases

The result in Table 2 shows that Chi-Square statistic was significant, $\chi 2$ (120, N = 400) = 2491.231, p < .001. Similarly, the likelihood ratio was also significant $\chi 2$ (120) =1311.467, p < .001). These results indicate that the observed differences in the mean ratings of skill need and performance are unlikely to have occurred by chance. Therefore, the null hypothesis is rejected, indicating that there is a significant difference in the mean rating of the responses of farmers regarding skill need and performance in planning for pepper production.

Research Question 2

What are the skill improvement needs of farmers in planting of pepper for increase production in River State?

Table 3: Skill Improvement Needs of Farmers in Planting of Pepper Production in River State.

S/N	ITEM STATEMENT	$\bar{X}_n$	$\bar{X}_p$	PG $(\bar{X}n - \bar{X}p)$	Remark
1	Transplant pepper seedlings at 10-15cm height with a ball of earth around April and May using a hand trowel.	1.93	3.05	-1.12	INN
2	Plant seedlings at a spacing of 60cm x 60cm on the beds or ridges.	3.88	1.13	2.75	IN
3	Cover the seedling stands with light soil.	1.68	3.33	-1.65	INN
4	Apply organic manure to the pepper seedlings transplanted.	2.55	2.45	0.10	IN
5	Use single node cuttings for mass propagation.	3.98	1.03	2.95	IN
6	Use upper nodal position of juvenile materials cut.	3.98	1.03	2.95	IN
7	Mulch the base of grooves with dry grass.	3.88	1.13	2.75	IN
8	Use high humidity propagator and watered twice a day.	3.65	1.35	2.30	IN
	Pooled PG	**3.19**	**1.81**	**1.38**	**IN**

Keys: Xn- mean of need category, Xp-mean of performance category, PG- performance gap, IN- improvement needed, INN- improvement not needed

The result of the data presented in Table 3 indicate that all the items except items 1 and 3 had their performance gap (PG) ranging from 0.10 to 2.95 and are all positive. This means that the level at which the pepper farmers perform in the items are lower than the level at which they are needed, implying that improvement is needed in the items. However, items 1 and 3 had their performance gap (PG) ranging from -1.12 to -1.65 and are negative. This means that the

items are performing higher than they are needed, implying that pepper farmers do not need improvement in those planting items. The pooled PG of 1.38 implies that in all, pepper farmers need improvement in planning of pepper production

Research Question 3

What are the skill improvement needs of farmers in harvesting of pepper in River State?

Table 4: Skill Improvement Needs of Farmers in harvesting of Pepper in River State.

S/N	ITEM STATEMENT	$\bar{X}_n$	$\bar{X}_p$	PG $(\bar{X}n - \bar{X}p)$	Remark
1	Plan for the harvesting of matured fruits by picking.	1.58	3.43	-1.85	INN
2	Pick the first harvest of pepper beginning from 8-12 weeks after transplanting.	3.55	1.45	2.10	IN
3	Pick fresh green pepper fruits 5-15 days before the peppers ripen.	3.48	1.53	1.95	IN
4	Arrange for packing of fruits in well aerated baskets.	1.93	3.08	-1.15	INN
5	wash with water within 230-1,430min after being harvested to remove impurities.	3.88	1.13	2.75	IN
6	scald the fresh pepper fruits in the steps to harvest the seed.	3.90	1.10	2.80	IN
	Pooled PG	**3.05**	**1.95**	**1.10**	**IN**

Keys: Xn- mean of need category, Xp-mean of performance category, PG- performance gap, IN- improvement needed, INN- improvement not needed

The result of the data presented in Table 4 reveals that all the items except items 1 and 4 had their performance gap (PG) ranging from 1.95 to 2.80 and are all positive. This means that the level at which the pepper farmers perform in the items are lower than the level at which they are needed, implying that improvement is needed in the items. However, items 1 and 4 had their performance gap (PG) ranging from -1.15 to -1.85 and are negative. This means that the items are performing higher than they are needed, implying that pepper farmers do not need improvement in those items in harvesting. The pooled PG of 1.10 implies that in all, pepper farmers need improvement in harvesting of pepper.

Research Question 4

What are the skill improvement needs of farmers in marketing of pepper in River State?

Table 5: Skill Improvement Needs of Farmers in Marketing of Pepper in River State.

S/N	ITEM STATEMENT	$\bar{X}_n$	$\bar{X}_p$	PG $(\bar{X}n - \bar{X}p)$	Remark
1	Prepare pepper for sale fresh or dry to recommendations	1.55	3.55	-2.00	INN
2	Advertise for pepper fruit.	3.67	1.33	2.34	IN
3	Search for market for Pepper fruit.	3.93	1.08	2.85	IN
4	Grade your pepper according to quality and quantity.	3.90	1.10	2.80	IN
5	Determine prices based on colour and size.	3.93	1.08	2.85	IN
6	Determine when to sell pepper fruit for profit.	3.95	1.02	2.93	IN
7	Supply pepper fruit to the consumers	1.48	3.53	-2.05	INN
8	Keep adequate records of pepper harvested and sold at all Times	3.93	1.08	2.85	IN
9	Keep record of pepper fruit sales	3.95	1.05	2.90	IN

10	Evaluate services to consumers	3.93	1.28	2.65	IN
11	Record all income and expenses	3.85	1.10	2.75	IN
12	Determine the profit margin in pepper fruit marketing	4.00	1.00	3.00	IN
	Pooled PG	**3.51**	**1.51**	**2.00**	**IN**

Keys: Xn- mean of need category, Xp-mean of performance category, PG- performance gap, IN- improvement needed, INN- improvement not needed

The result of the data presented in Table 5 shows that all the items except items 1 and 7 had their performance gap (PG) ranging from 2.34 to 3.00 and are all positive. This means that the level at which the pepper farmers perform in the items are lower than the level at which they are needed, implying that improvement is needed in the items. However, items 1 and 7 had their performance gap (PG) ranging from -2.00 to -2.05 and are negative. This means that the items are performing higher than they are needed, implying that pepper farmers do not need improvement in those items in marketing. The pooled PG of 2.00 implies that in all, pepper farmers need improvement in marketing of pepper.

HO_2: There is no significant difference in the mean rating of the responses of farmers on skill need and performance in marketing of pepper.

Table 6: Chi- square result in the Mean Rating of the Responses of Farmers on Skill needed in Marketing of Pepper

Test	Value	Df	P value
Pearson Chi-Square	4000.000[a]	100	.000
Likelihood Ratio	1514.791	100	.000
Linear-by-Linear Association	399.000	1	.000
N of Valid Cases	400		

df= difference, N of Valid Cases= Number of Valid Cases

The P Chi-Square test revealed a significant result, $\chi 2$ (100, N = 400) = 4000.000, $p < .001$. Similarly, the likelihood ratio was also significant (χ^2 (100) = 1514.791, $p < .001$). These findings demonstrate that the differences in the mean ratings of skill need and performance in marketing are statistically significant and not due to chance.

Consequently, the null hypothesis is rejected. This result indicates a significant difference in the mean rating of the responses of farmers on skill need and performance in marketing of pepper. The findings suggest that gaps exist between the skills required and actual performance in marketing activities, which may impede the effective distribution and sale of pepper.

Discussion of Findings

The findings showed that there was the significant skill improvement needs of farmers in planning for pepper production in River State. This aligns with previous research conducted by Ajah *et al.* (2021), who emphasized that skill gaps in agricultural planning significantly hinder productivity and profitability. The Performance Gap (PG) reflects inadequate proficiency in critical aspects of planning, which may include seed selection, resource allocation, and pest management, as noted in similar contexts by Smith and Adegbite (2020). However, the findings agreed Johnson and Udo (2019), who reported minimal skill gaps in similar regions, attributing better performance to sustained extension services. This contrast underscores the variability in access to agricultural training programmes across different communities, as highlighted by Adebayo and Omotola (2023).

The significant Chi-Square statistic ($\chi 2$ (120, N = 400) = 2491.231, p < .001) as tested reinforces that the observed differences in skill need and performance are not random but indicative of systematic deficiencies. This corroborated findings by Okeke *et al.* (2022), who identified significant correlations between training deficits and productivity shortfalls in rural agricultural sectors. Addressing these gaps could facilitate better decision-making and resource utilization, ultimately enhancing pepper production.

The findings revealed a significant need for skill enhancement among farmers in planting operations for pepper production in River State, as evidenced by the Performance. This, highlights notable deficiencies in planting techniques, including seed spacing, planting depth, and crop management. These findings aligned with earlier research by Adekunle and Umeh (2022), who noted that inadequate planting skills often lead to suboptimal crop yields, particularly among smallholder farmers. However, these findings agreed Johnson *et al*. (2021), who reported minimal skill deficiencies in planting operations, attributing this to the availability of agricultural extension services in their study area. This discrepancy underscores the need for context-specific interventions, particularly for women farmers in resource-limited regions such as River State. Bridging these skill gaps can empower farmers to adopt best practices, thereby improving their level of production.

The findings showed a significant need for skill improvement in harvesting operations among women farmers involved in pepper production in River State. The Performance Gap suggests that deficiencies in critical harvesting skills, such as proper timing, handling, and storage techniques, impact both the quality and efficiency of the process. This finding aligned with Adeyemi *et al.* (2022), who noted that skill deficits in harvesting operations often lead to post-harvest losses and reduced market value in smallholder farming. Conversely, Johnson and Udo (2019) observed minimal gaps in harvesting skills in regions with robust extension service networks, suggesting that support structures can mitigate skill deficiencies. However, the present study's findings reflect the unique challenges faced by farmers in River State, including limited access to extension services and agricultural resources. Addressing these skill gaps through practical training and resource allocation could significantly improve the quality and efficiency of pepper harvesting operations.

The findings showed that there is a substantial need for skill enhancement among farmers in pepper marketing in River State. Key areas requiring improvement include financial management, market analysis, and consumer engagement. These skills are essential for increasing profitability and operational efficiency. This aligned with Adekunle and Umeh (2022), who identified similar gaps in marketing skills among smallholder farmers, noting that inadequate knowledge in these areas often results in reduced market competitiveness.
However, Johnson and Musa (2021) reported contrasting findings in regions with established cooperative societies, where collective marketing strategies mitigated individual skill deficiencies. This suggests that structural support systems may influence the extent of skill gaps. Addressing the identified needs through capacity-building programmes and access to market information could empower women farmers to engage effectively in pepper marketing, improving their profitability and overall economic resilience.

The result confirms a systematic difference in skill needs and performance. This corroborated with findings of Adekunle and Johnson (2023), who identified that limited technical knowledge in post-harvest handling undermines value addition and market competitiveness. Furthermore, Olayemi *et al.* (2023) emphasized that inadequate skills in advanced processing, such as spice blending and inventory management, reduce profitability in small-scale farming enterprises.

CONCLUSION

Based on the findings of this research, the researchers conclude that pepper farmers in River State, particularly in areas such as planning, planting, harvesting and marketing of pepper should be given adequate training to enhance better performance. The significant Performance Gaps, supported by Chi-Square test results, revealed that these deficiencies are not due to chance but represent systemic challenges that hinder production and profitability.

RECOMMENDATIONS

Base on the findings, the following recommendations were made:

1. Extension agent should establish targeted training programmes to improve farmers' skills in planning for pepper production.
2. Farmers should be provided with practical training by extension agents on how to carry out pepper planting for better growth and production in the area.
3. The extension agents should organize workshops in skill acquisition Centre to demonstrate to farmers proper harvesting practices, including timing, to minimize losses and maintain pepper quality.
4. Stakeholders in pepper farming should create capacity-building programmes focused on financial management, market analysis, and consumer engagement to enhance the profitability and operational efficiency of pepper marketing by farmers.

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The Gig Economy in Nigeria's Digital Media and Creative Industries: Opportunities and Precarity

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Abstract

This article examines the expansion of gig work within Nigeria's digital media and creative industries and asks whether this expansion is better understood as a pathway to inclusion or as a new form of labour insecurity. The study adopts a mixed-methods approach, predominantly utilising qualitative documentary analysis supplemented by preliminary survey data, synthesising peer-reviewed scholarship on platform labour and creative work with official Nigerian labour, Gross Domestic Product (GDP) and payment-system data. The analysis shows that Nigeria's creative gig economy has grown at the intersection of three dynamics: rapid digital diffusion, the project-based organisation of creative production, and an already informal labour market in which self-employment and informal employment are dominant. On the opportunity side, gig work lowers entry barriers, enables portfolio careers, expands market access for designers, editors, marketers, and creators, and creates pathways into local and transnational client markets. On the precarious side, workers face irregular earnings, non-payment, algorithmic dependence, weak bargaining power, limited social protection, and the transfer of production costs such as connectivity, electricity, and devices to individuals. The article argues that the Nigerian case is best understood as a hybrid labour regime in which platformisation is layered onto pre-existing informality rather than replacing standard employment. This framing contributes to gig-economy scholarship by linking platform governance to African labour-market structure and to the specific logics of cultural and digital production. The paper concludes that the developmental promise of the sector depends on reforms around worker classification, portable benefits, payment security, digital infrastructure, and collective representation.

Keywords: Gig economy; Nigeria; creative industries; platform labour; precarious work.

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INTRODUCTION

The expansion of gig work has become one of the defining features of contemporary labour-market change. Across the world, digital platforms and networked communication tools now connect clients, intermediaries, audiences, and workers in ways that make it easier to break labour into short-term tasks, project contracts, and on-demand services (Graham et al., 2017; Wood et al., 2019a). In the creative industries, this transformation is especially visible. For instance, presently, graphic design, copywriting, video editing, social media management, animation, music promotion, podcast production, and influencer marketing circulate through platform-mediated and digitally coordinated markets, in which workers are expected to be flexible, visible, entrepreneurial, and continuously available (Duffy & Meisner, 2023; Nieborg & Poell, 2018; Peres et al., 2024).

In Nigeria, the rise of gig work is inseparable from the country's larger digital transition and from the long-standing informality of its labour market. Daodu and Babajide (2024) and Kemp (2025) reported that Nigeria had 165 million mobile connections, 109 million internet users, and 47.8 million social media user identities in late 2025. At the same time, official labour data showed that the majority of work in Nigeria is already outside standard wage employment: the National

Bureau of Statistics (NBS, 2024a) reported that 85.6% of employed persons were self-employed and 93.0% were in informal employment in the second quarter of 2024. This context matters analytically. The Nigerian gig economy is not simply a transition from secure employment to platform work; rather, it is a new layer of market coordination built onto an economy where livelihood insecurity, self-employment, and weak social protection have long been widespread.

Nigeria's digital media and creative industries provide a particularly important site for examining this development. The services sector contributed 58.76% of aggregate GDP in the second quarter of 2024, growing by 3.79% year on year (NBS, 2024b). Within this broad services economy, cultural and digital production are increasingly visible in film, music, advertising, software, publishing, communications, and online content creation (Nwankwo, 2018; Ogbonna, 2023). UNESCO (2021) estimated that Africa's film and audiovisual industries currently employ about 5 million people and contribute US$5 billion to continental GDP, with Nigeria producing around 2,500 films annually. Yet, the economic organisation of this activity is not fully captured by formal sector labels. Much of the work is temporary, commissioned, subcontracted, informally negotiated, or monetised through platforms and audience metrics rather than long-term employment contracts (Lobato, 2010; Opesade, 2024).

Interestingly, public discourse often presents this transformation in celebratory terms. The gig economy is said to democratise access to work, empower youth, promote entrepreneurship, and connect Nigerian talent to global opportunity. These claims are not entirely false. Digital gig work can indeed widen access to clients, reduce barriers to market entry, and enable creative workers to combine multiple income streams. However, the same institutional arrangements that create these opportunities described above do not eliminate precarity, such as shifting risks from firms and platforms to individual workers, and income volatility. The challenges are well captured in the finding of Opesade (2024) that Nigerian digital freelancers experience the gig economy as beneficial but highly challenging. Elaborating the precarity further, Opesade (2024) posited that gig workers are paid per task, per project, or per campaign, and workflows are rarely continuous. Significantly, rankings, ratings, algorithmic visibility systems, and project-based contracting broaden access to markets, and simultaneously normalise income volatility, unpaid labour, and weak bargaining power (Anwar & Graham, 2021; Wood et al., 2019a, 2019b).

This article therefore asked two related questions. First, what opportunities does the gig economy create within Nigeria's digital media and creative industries? Second, how do those opportunities coexist with and reproduce labour precarity? The paper argued that Nigeria's creative gig economy is best understood as a hybrid labour regime shaped by the interaction of platformisation, entrenched informality, project-based cultural production, and infrastructural inequality. This argument contributes to scholarship in three ways. It contextualises gig work within African labour-market structure rather than treating Western standard employment as the default baseline. It connects literature on platform labour to literature on cultural and creative production. Finally, it shows that opportunity and precarity in Nigeria's creative gig economy are not opposing outcomes but co-produced effects of the same digital and institutional arrangements.

METHODOLOGY

The article adopts a mixed-methods approach, predominantly utilising qualitative documentary analysis supplemented by preliminary survey data. Documentary analysis is appropriate where the research problem requires the systematic interpretation of existing texts, reports, statistics, and policy materials in order to identify patterns, categories, and social meanings (Bowen, 2009).

To contextualise the documentary data and ground the research in the practical realities of Nigerian digital freelancers, a scoping survey was conducted. The study employed a volunteer sampling technique to select the survey respondents. Participants were recruited through open invitations distributed across professional digital platforms and creative networks, allowing individuals who met the inclusion criteria to willingly opt into the study. The final sample's demographic distribution accounted for 22 respondents in the employee category—who engage in gig work concurrently with formal employment—alongside full-time independent digital freelancers. This volunteer-based primary data provided crucial initial insights that guided the thematic coding of the secondary data.

The documentary corpus for this study comprises three categories of material. The first category consists of peer-reviewed academic literature on the gig economy, algorithmic management, digital labour, creative work, and African platform economies. The second includes official and quasi-official datasets and reports, especially publications from the National Bureau of Statistics, the Central Bank of Nigeria, UNESCO, and DataReportal. The third includes current scholarly and industry-facing work on the creator economy and platformised cultural production. Documents were selected on the basis of relevance to Nigeria or Sub-Saharan Africa, conceptual value for understanding digital creative labour, and recency, especially for labour-market, GDP, payment, and digital-adoption data.

The materials were read comparatively and coded thematically around six issues: labour-market context, digital infrastructure, opportunity structures, precarity mechanisms, platform governance, and policy implications. Bringing together macro-level evidence, volunteer survey insights, and existing research allows this study to produce a coherent explanatory account of how Nigeria's creative gig economy is organised and why its opportunities are inseparable from its vulnerabilities.

Nigeria's digital media and creative industries as a gig-work ecosystem

Nigeria's digital media and creative industries are not a single sector in any narrow statistical sense. They cut across film, music, online publishing, advertising, software, design, digital marketing, social media content, and a growing creator economy. This dispersion partly explains why the sector is frequently celebrated in public discourse but harder to quantify in official accounts. As Nwankwo (2018) argued, Nigeria's creative industries have substantial cultural visibility and economic potential, yet sector mapping and coherent policy support remain weak. Ogbonna (2023) similarly showed that even where specific subsectors, such as software, demonstrate clear potential, growth is constrained by infrastructural, skills, and financing challenges.

Over the past decade, the degree to which cultural production, promotion, and monetisation have become platform dependent has increased. Nieborg and Poell (2018) described platformisation as the penetration of platform infrastructures and market logics into cultural production. This idea is especially useful in the Nigerian context. Many creative workers do not depend exclusively on formal labour platforms such as Upwork or Fiverr; they also obtain gigs through Instagram pages, WhatsApp referrals, Telegram groups, YouTube channels, TikTok visibility, and direct messaging networks. Platformisation, in other words, should be understood broadly: not merely as participation in a freelance marketplace, but as the wider reorganisation of discovery, distribution, payment, reputation, and audience-building through digital platforms.

The enabling conditions for this ecosystem are visible in current digital and payment data. Nigeria's high levels of mobile and internet adoption create a large social and commercial environment for online promotion, content circulation, and remote service delivery (Kemp, 2025). Payment infrastructure has also deepened. The Central Bank of Nigeria (CBN, 2024) reported that

internet transfers accounted for 51.91% of e-payment volume and 52.95% of e-payment value in the first half of 2024; during that period, internet transactions reached 11.64 billion in volume and N825.50 trillion in value. For creative gig work, this matters because digital labour markets require not only visibility but also payment rails that make remote contracting, milestone billing, audience monetisation, and cross-platform commerce possible.

The structure of creative labour itself also favours gigification. Cultural production is inherently project based: a campaign, a film edit, a logo package, a rollout plan, a music video, a season of podcast episodes, a brand account, or a series of posts. Firms and clients often need specialised skills intermittently rather than continuously. This creates demand for flexible commissioning and subcontracting. In Nigeria, such demand comes not only from formal corporations but also from start-ups, Small and Medium Enterprises (SMEs), Non-Governmental Organisations (NGOs), churches, political organisations, entertainment brands, and individual creators. The result is a broad market for short-term creative labour that sits somewhere between entrepreneurship, informal self-employment, and subcontracted digital work.

It is useful to distinguish two overlapping segments within this ecosystem. The first is client-facing freelance work, in which workers sell services such as design, editing, copywriting, digital marketing, account management, and production support to paying clients. The second is audience-facing creator labour, in which individuals build audiences on platforms and attempt to monetise attention through advertising, sponsorship, affiliate links, subscriptions, or brand partnerships (Peres et al., 2024; Rieder et al., 2023). The distinction matters because the revenue models differ, but the two forms increasingly overlap. A social media manager may also be a creator; a video editor may use content creation to attract clients; a musician may rely on freelance promotional labour while simultaneously monetising audience attention. In both cases, work is shaped by visibility systems, data metrics, and platform rules.

Opportunities in the creative gig economy

Labour-market entry and livelihood absorption

The first major opportunity created by the gig economy is labour-market entry. In an economy where standard formal employment remains limited, digital gig work offers an accessible route through which young people and skilled workers can monetise capabilities that might otherwise remain underused. Nigeria's labour-force data underline this point. With self-employment already dominant and informal employment pervasive, gig work functions less as an exceptional arrangement than as a digitally mediated form of livelihood absorption (NBS, 2024a). For many workers, especially younger entrants, the practical comparison is not between freelancing and secure salaried employment, but between freelancing and joblessness, underemployment, or low-return informal work.

This does not mean all barriers disappear. Access still depends on devices, skills, connectivity, language proficiency, and social networks. But compared with the capital requirements of many offline ventures, digital creative freelancing often has a lower threshold of entry. A laptop, smartphone, editing software, basic connectivity, and a portfolio can be enough to begin. Opesade's (2024) study of Nigerian digital freelancers reinforced this point: workers are drawn to gig work because it offers immediacy, flexibility, and an identifiable route to income generation, even if that route is unstable.

Portfolio careers, entrepreneurial agency, and transnational reach

A second opportunity lies in the expansion of portfolio careers. Instead of depending on one employer, workers can combine projects across multiple clients, sectors, and platforms. This

diversification can create a degree of autonomy and reduce dependence on a single source of income. Graham et al. (2017) noted that digital labour platforms can allow workers to transcend the limits of local labour markets by reaching geographically distant clients. For Nigerian creatives, this may mean working for a Lagos fashion brand, an Abuja NGO, and an overseas start-up within the same month. In some cases, it also creates access to foreign-currency earnings and global professional exposure.

This opportunity is especially significant in creative fields where reputation and demonstrable output matter more than formal organisational rank. A well-curated portfolio, strong client testimonials, and visible work on social platforms can substitute, at least partially, for traditional career ladders. Gig work can therefore operate as a mode of entrepreneurial self-construction. Workers learn to package services, brand themselves, negotiate prices, and translate creative skill into commercial offerings. This entrepreneurial dimension helps explain the appeal of gig work to many Nigerian creatives. It aligns with wider social narratives of hustle, self-reliance, and youth enterprise, but it also has practical value in building adaptable careers in volatile labour markets.

Skills development and sectoral spillovers

A third opportunity lies in accelerated learning and cross-sector mobility. Gig workers acquire a mix of technical, relational, and commercial skills by handling diverse briefs across industries. Designers learn brand strategy; editors learn campaign thinking; content creators learn analytics, audience development, and platform-specific optimisation. These forms of practical learning can be quicker and more market responsive than those available in many formal employment settings.

The opportunity extends beyond individual careers. Nigeria's wider creative economy depends heavily on flexible specialist labour. Nollywood productions, music releases, digital advertising campaigns, software products, and creator brands all rely on workers who can be mobilised rapidly for discrete tasks. In this sense, gig work supplies organisational flexibility to the sector as a whole. Nwankwo (2018) and Ogbonna (2023) both suggested that Nigeria's creative industries possess considerable growth potential but require more effective ecosystems to translate talent into durable value. The gig economy partially addresses this need by making creative skills more searchable, more modular, and more commercially deployable.

The creator economy adds a further layer of opportunity. Peres et al. (2024) showed that digital platforms allow individuals to transform creative output into monetisable micro-enterprises, while Rieder et al. (2023) demonstrated that creators increasingly diversify revenue through cross-platform linking and multiple income streams. In Nigeria, where youth culture, music, humour, fashion, and commentary circulate strongly online, this opens spaces for creators to build brands and for support workers—editors, designers, managers, and strategists—to sell services around them. The result is not merely more content but a broader service ecology of digital creative labour.

Precarity and structural constraints

Income volatility, weak bargaining power, and unpaid labour

The opportunities described above do not eliminate precarity; they often reorganise it. The most immediate problem is income volatility. Gig workers are paid per task, per project, or per campaign, and workflows are rarely continuous. Periods of intense activity are followed by dry spells. Opesade (2024) found that Nigerian digital freelancers experience the gig economy as beneficial but highly challenging, a judgment that captures this tension well. The absence of stable

salaries makes planning difficult, especially in an inflationary environment where the costs of data, electricity, software, and devices remain substantial.

Bargaining power is also typically weak. Graham et al. (2017) showed that workers on digital labour platforms face asymmetrical conditions in which clients and intermediaries are better positioned to set terms. In the Nigerian creative context, these asymmetries appear in rate suppression, delayed payment, uncompensated revisions, and "scope creep," where clients expand deliverables without proportional increases in pay. The glamour attached to creative work can further obscure the labour involved, leading some clients to treat design, content, or editing as inexpensive add-ons rather than skilled professional services.

Moreover, gig earnings often rest on significant quantities of unpaid work. Workers spend time prospecting, pitching, revising samples, posting content, maintaining portfolios, nurturing audiences, and managing communications. This labour is essential to income generation but not directly remunerated. Wood et al. (2019b) described such dynamics as part of a broader commodification process that exposes workers to market discipline without adequate institutional shielding. For Nigerian creatives, the problem is intensified by the absence of robust contractual enforcement and by the normalisation of informal business practices.

Algorithmic management and the politics of visibility

A second cluster of constraints stems from platform governance. Wood et al. (2019a) argued that the promise of autonomy in the gig economy coexists with algorithmic control. Ratings, rankings, performance scores, search visibility, and client-review systems structure access to work and can compel workers to accept unreasonable conditions in order to protect reputation metrics. Anwar and Graham (2021) similarly showed that African gig workers operate within systems that offer flexibility while simultaneously producing vulnerability, dependence, and constrained agency.

Although some Nigerian creative work is organised off formal labour platforms, visibility itself has become algorithmically mediated across the wider digital environment. Duffy and Meisner (2023) showed that creators on social media are subject to platform governance through opaque forms of algorithmic (in)visibility. This insight is relevant well beyond influencer labour. A designer depends on discoverability on Instagram or X; a writer depends on search, shares, or platform engagement; a videographer depends on visibility signals that help attract clients; a creator-manager depends on platforms that can change monetisation rules, moderation standards, or recommendation systems without negotiation. In all these cases, visibility is not merely promotional; it is part of the labour process.

This produces a specific form of insecurity. Workers must constantly optimise for discoverability without controlling the systems that determine it. They are pushed to remain active, responsive, and strategically visible, yet a change in algorithmic ranking, content moderation, or account status can sharply reduce income opportunities. Adekoya et al. (2023) showed, in the Nigerian platform context, that algorithmic management reshapes employment relations by embedding control within digital systems rather than face-to-face supervision. While their study focuses on ride-hailing, the broader insight travels to digital creative work: technology can intensify labour discipline while leaving workers formally classified as independent.

Social protection gaps, informality, and infrastructural precarity

The most serious structural problem may be the absence of social protection. Gig workers are generally excluded from employer-provided pensions, health insurance, paid leave, unemployment protection, and institutional grievance procedures. This is because they are usually

treated as contractors rather than employees. In a context where formal welfare coverage is already limited, this exclusion is highly consequential. Ajonbadi et al. (2025) showed that questions of voice, representation, and decent work remain central in the Nigerian gig economy, especially because workers often lack formal channels through which to contest unfair treatment or improve conditions.

This is where the Nigerian case departs from simplified narratives of platform disruption. In contexts with stronger labour protections, platform work often appears as the erosion of a previously dominant standard employment model. In Nigeria, by contrast, platformised creative labour frequently extends pre-existing informal conditions into digital space. Lobato's (2010) analysis of Nollywood as an informal creative economy is instructive here: informality has long been central to Nigerian cultural production. What digital platforms do is not erase this history but reorganise it through new systems of searchability, data capture, payment, and reputation. The result is a hybrid condition in which old and new precarities accumulate.

Infrastructural inequality compounds the problem. Participation in the creative gig economy requires reliable electricity, devices, data, software, and payment access, yet the costs and uncertainties associated with these inputs are borne mostly by workers themselves. Digital adoption in Nigeria is substantial (Kemp, 2025), but access remains uneven, and connectivity is not equivalent to frictionless work capacity. Even when demand exists, workers may lose productive time to power outages, connectivity failures, device breakdowns, or payment bottlenecks. The CBN's (2024) data demonstrated that digital payments are deeply embedded in everyday transactions, but scale at the payments layer does not automatically translate into equitable working conditions at the labour layer.

Discussion and policy implications

The central finding of this article is that the Nigerian creative gig economy cannot be explained by either celebratory entrepreneurship narratives or generic precarity arguments alone. It should instead be understood as a hybrid labour regime in which platformisation is layered onto entrenched informality. This interpretation helps reconcile the sector's contradictory features. Gig work expands access to clients, income opportunities, and creative entrepreneurship, but it does so through labour arrangements that individualise risk, intensify competition, and weaken institutional protection.

This framing contributes to the literature in at least three respects. First, it challenges the tendency to treat standard employment as the implicit baseline from which gig work deviates. In Nigeria, the baseline for many workers is already informal, self-employed, and insecure (NBS, 2024a). Second, it extends scholarship on digital labour by bringing cultural and creative production to the centre of analysis. Creative work is not a minor niche within the gig economy; it is one of the most visible arenas in which platform logics now shape labour. Third, it shows that client-facing freelancing and audience-facing creator labour, although organised differently, are linked by common dependencies on visibility, metrics, and weak social protection.

Policy responses therefore need to move beyond the binary of either celebrating innovation or attempting to force all gig work into existing employment categories without nuance. The immediate priority is the improvement of minimum conditions of decent work. This includes clearer rules around contracts, payment terms, intellectual property, and dispute resolution; more adaptable social-protection mechanisms for self-employed digital workers; and greater accountability for platforms and intermediaries whose design choices shape visibility and bargaining power. Ajonbadi et al. (2025) made a strong case that voice and representation are central to decent work in the Nigerian platform economy. Their insight applies directly to creative labour, where freelancers often remain atomised even when they share common problems.

There is also a case for ecosystem-level support. Nwankwo (2018) and Ogbonna (2023) both suggested that Nigeria's creative industries need stronger policy coordination if their economic promise is to be realised. For gig workers, this means more than generic entrepreneurship rhetoric. It requires affordable broadband, more reliable electricity, improved digital-payment interoperability, accessible legal literacy on contracts and intellectual property, and training that combines technical skills with pricing, client management, and business sustainability. Informal peer communities already perform some of these functions. Wood et al. (2018) showed that online worker communities can offer protection, information, and solidarity, while Ajonbadi et al. (2025) documented the importance of both formal and informal voice channels in Nigeria. Public policy should strengthen rather than ignore these associational infrastructures.

Conclusion

The gig economy has become a major organisational form within Nigeria's digital media and creative industries. Its growth is driven by digital diffusion, project-based production, and a labour market in which self-employment and informality are already dominant. This article has shown that the sector generates meaningful opportunities: it widens entry into paid work, supports portfolio careers, improves market reach, and enables new forms of creative entrepreneurship. At the same time, it reproduces serious forms of precarity through income volatility, weak bargaining power, algorithmic dependence, limited social protection, and worker-borne infrastructural costs.

The Nigerian case therefore demands a more context-sensitive understanding of the gig economy. The central issue is not whether gig work is simply good or bad. It is that the same structures that make creative work more accessible also make it more insecure. The article's main contribution has been to conceptualise this condition as a hybrid labour regime shaped by both platformisation and pre-existing informality.

Further research should now move beyond macro-synthesis to sector-specific empirical work. Interviews and longitudinal studies are needed on digital creators, freelance designers, editors, strategists, and production workers across regions and subsectors. Comparative work should examine differences between client-based freelancing and audience-based creator labour, as well as the gendered and regional inequalities that structure access to visibility, income, and protection. Only by connecting digital opportunity to labour conditions can scholarship and policy fully assess the developmental significance of Nigeria's creative gig economy.

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Communication Channels, Feedback Mechanisms and Dealership Performance: Evidence from MTN Dealers in Lagos State, Nigeria

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Abstract

This study investigated how MTN Nigeria's communication-channel choices and feedback mechanisms influence dealership performance in Lagos State, Nigeria, with strategic alignment and perceived customer satisfaction treated as performance outcomes. The study responded to a practical problem in telecommunications channel management: formal communication systems may exist, but dealer performance depends on whether messages are routed through appropriate channels, reach decision-makers and generate timely feedback closure. Anchored on Media Richness Theory, Participatory Communication Theory and Agency Theory, the study adopted a descriptive mixed-methods design. Dealers Perception on MTN Downstream Channel Communication questionnaire was administered to 222 registered MTN dealer-owners selected through stratified random sampling across Lagos West, Lagos East and Lagos Central. Twelve dealer representatives were also interviewed for qualitative explanation of survey patterns. Quantitative data were analysed with frequencies, means and simple linear regression, while interview data were thematically interpreted. The study discovered that channel appropriateness drives alignment ($r^2 = 0.55$). Finally, the research revealed that responsiveness drives satisfaction ($R^2 = 0.39$). However, dealers rated message routing to owners, the dealer portal, complaint acknowledgement timelines and shared learning from feedback poorly. The study concluded that dealership performance is shaped less by information volume than by channel fit, decision-maker targeting and feedback responsiveness. It recommended verified owner-facing digital channels, service-level agreements for dealer tickets and a searchable knowledge base built from resolved feedback cases.

Keywords: Downstream communication, feedback mechanisms, dealer performance, strategic alignment, telecommunications.

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INTRODUCTION

Telecommunications has become a central infrastructure of Nigeria's digital economy. It supports everyday social interaction, business transactions, financial inclusion, education, logistics and public communication. The sector's importance is reflected in national output: Telecommunications and Information Services contributed 16.06% to Nigeria's real gross domestic product in the second quarter of 2023 (National Bureau of Statistics [NBS], 2023a). Lagos State is especially significant because it combines Nigeria's largest commercial concentration with a highly competitive retail and service environment. NBS telecommunications data also identify Lagos as a leading state for active voice and internet subscriptions, making it a strategic market for network operators (NBS, 2023b).

Within this competitive environment, MTN Nigeria remains a major operator with a wide subscriber base, broad digital-service portfolio and extensive distribution architecture (MTN Nigeria Communications Plc, 2024). Its market strength, however, is not produced by network infrastructure and advertising alone. It also depends on how effectively dealer networks interpret corporate messages, execute product and campaign directives, resolve customer

concerns and represent the brand consistently at the point of sale. Dealers therefore serve as the last-mile interface between the company and subscribers.

Downstream channel communication refers to the flow of information, directives, explanations and persuasive messages from a principal organisation to intermediaries such as distributors, dealers, sub-dealers and retailers. In telecommunications, this flow includes product updates, campaign mechanics, tariff changes, commission structures, customer-service procedures, regulatory compliance instructions and training notices. Channel-management literature shows that communication coordinates behaviour, reduces uncertainty, clarifies expectations and strengthens relationship quality among partners (Mohr & Nevin, 1990; Rosenbloom, 2013; Stern et al., 2006).

For a telecom operator, the communication channel selected for a message is itself a strategic decision. Complex or ambiguous issues may require interactive channels that permit immediate clarification, while routine notices may be adequately transmitted through leaner channels such as SMS, email or app notifications. Feedback mechanisms are equally important because dealers need reliable ways to report customer complaints, competitor actions, operational bottlenecks and emerging market conditions. This study therefore examined two connected dimensions of MTN's downstream communication in Lagos State: the appropriateness of communication channels and the effectiveness of feedback mechanisms.

Statement of the Problem

A telecommunication company may possess a strong brand, advanced infrastructure and a large subscriber base, yet still experience uneven performance across its dealership network. In Lagos State, where competition is intense and customers can easily compare providers, communication failures at the dealer level can affect sales execution, customer trust and brand consistency. A dealer who receives a complex policy through an inappropriate channel, or whose owner does not receive strategic messages directly, may fail to align outlet-level decisions with corporate priorities. Similarly, a dealer who can log a customer complaint but cannot obtain a timely response may lose customer goodwill despite using an official feedback system.

Okorie and Opeodu (2018) confirms the importance of communication in channel relationships, but there remains a need for context-specific evidence on how particular communication attributes influence dealership performance in Nigeria's telecommunications sector. Previous Nigerian studies have discussed channel-management performance and communication challenges in broad terms (Adebayo & Oduwole, 2021; Okorie & Opeodu, 2018). However, fewer studies have provided quantitative and qualitative evidence on the specific effects of communication-channel choice and feedback mechanisms among telecom dealers in Lagos State. The problem is therefore not merely whether MTN communicates with dealers, but whether the selected channels fit the message, reach the correct decision-makers and enable timely feedback closure.

Objectives of the Study

The study was guided by the following objectives:

1. To examine how the choice of communication channels used by MTN influences the strategic alignment of its dealers in Lagos State.
2. To assess the influence of feedback mechanisms within MTN's downstream communication structure on customer satisfaction achieved by its dealers in Lagos State.

Research Questions

1. How does MTN's choice of communication channels influence the strategic alignment of its dealers in Lagos State?
2. What is the perceived influence of available feedback mechanisms in MTN's downstream communication on customer satisfaction at MTN dealerships in Lagos State?

Literature Review and Theoretical Framework

Communication-channel choice is a key issue in inter-organisational relationships because channel partners depend on timely, credible and understandable information to execute a principal's strategy. Mohr and Nevin (1990) argued that communication in marketing channels involves the frequency, direction, modality and content of information exchanged between channel members. In telecommunications dealership networks, these dimensions are visible in the use of dealer portals, emails, SMS alerts, WhatsApp groups, account-manager calls, webinars and physical briefings. The effectiveness of each channel depends on whether it matches the complexity and urgency of the message.

Feedback mechanisms extend communication beyond downward instruction. They allow dealers to provide field intelligence, report faults, escalate customer complaints and obtain guidance for service recovery. Participatory communication scholarship emphasises dialogue, ownership and joint problem-solving rather than one-way transmission of information (Mefalopulos, 2008; Servaes, 1999). In customer-facing dealership environments, feedback is performance-enhancing only when reports are acknowledged, tracked, resolved and converted into shared learning across the network.

The study is anchored on two complementary theories. Media Richness Theory, propounded by Daft and Lengel in 1986, explains why ambiguous or complex messages require rich channels that allow interaction, multiple cues and rapid feedback. Agency Theory, which was propounded by Meckling in the year 1976, explains the relationship between MTN as principal and dealers as agents. According to the theory, effective communication and feedback reduce information asymmetry, improve monitoring and support strategic alignment. Participatory Communication Theory, which was postulated by Lerner in 1958, explains the importance of dialogue and learning loops in complaint resolution and customer satisfaction. Together, these theories suggest that dealership performance should improve when messages are routed through appropriate channels and when feedback loops are timely, transparent and actionable.

METHODOLOGY

The study adopted a descriptive mixed-methods design. The quantitative component used a structured questionnaire to obtain measurable responses from dealer-owners, while the qualitative component used interviews to explain patterns observed in the survey. This design was appropriate because the study sought to describe dealer perceptions, test relationships among variables and interpret the meanings dealers attach to communication practices within MTN's distribution network (Creswell & Creswell, 2018).

The target population comprised registered MTN dealers operating in Lagos State. The source project identified an accessible population of 512 registered dealerships from MTN's 2024 business records. A sample of 222 dealer-owners was used for questionnaire administration. Stratified random sampling ensured balanced representation from the three senatorial districts of Lagos State: Lagos West, Lagos East and Lagos Central, with 74

respondents selected from each district. Twelve interviewees were also purposively selected, four from each senatorial district, to provide deeper qualitative insight.

The questionnaire contained demographic items and four-point Likert-scale statements: Strongly Agree = 4, Agree = 3, Disagree = 2 and Strongly Disagree = 1. Section B(i) measured perceptions of communication-channel choice and strategic alignment, while Section B(ii) measured perceptions of feedback mechanisms and customer satisfaction. The interview guide explored dealer experiences with formal channels, informal channels, escalation processes and customer complaint handling.

Content validity was strengthened through expert review. The experts checked and expressed their opinions on the correlation of vocabulary of the test with the objective of each axis. They also ensured the appropriateness of the questions to the level of tertiary institutions' students and dons.

The pilot test was conducted with 20 respondents outside the final study area, and the questionnaire achieved a Cronbach's alpha coefficient of .768, indicating acceptable internal consistency (Rattray & Jones, 2007). Quantitative data were analysed using frequencies, percentages, means and simple linear regression, while interview data were transcribed and thematically interpreted. Ethical procedures included informed consent, voluntary participation, confidentiality and anonymity of respondents.

RESULTS AND DISCUSSION

Table 1: Respondent Profile (N = 222)

Variable	Category	n	%
Role	Owner	222	100.0
Senatorial district	Lagos West; Lagos East; Lagos Central	74 each	33.3 each
Years as MTN dealer	4-6 years; 7-10 years; >10 years; no response	46; 68; 86; 22	20.7; 30.6; 38.8; 9.9
Full-time employees	1-4; 5-9; 10-19	22; 69; 131	9.9; 31.1; 59.0
Primary business focus	Mixed service dealership	222	100.0

The respondents were 222 MTN dealer-owners operating across Lagos State. The sample was geographically balanced, with 74 respondents each from Lagos West, Lagos East and Lagos Central. The respondents were experienced operators: 38.8% had operated as MTN dealers for more than ten years, 30.6% had seven to ten years of experience and 20.7% had four to six years of experience. Most outlets were small and medium-sized businesses, with 59.0% employing 10-19 full-time staff and 31.1% employing 5-9 staff. All respondents reported mixed business focus, meaning that their outlets combined services such as SIM registration, airtime/e-top-up, device sales and MoMo-related activities.

Research Question 1

How does MTN's choice of communication channels influence the strategic alignment of its dealers in Lagos State?

Table 2: Communication-Channel Indicators and Strategic Alignment

Indicator	Mean	Remarks
Rich channels for complex updates	3.88	Strongly agreed
Dealer portal as single source of truth	2.00	Disagreed
SMS/email for routine changes	3.64	Agreed
Two-way channels for clarification	3.96	Strongly agreed
Clear guidance on which channel to use	1.98	Disagreed
Cross-channel message consistency	3.86	Strongly agreed
Appropriate delivery of training invitations	4.00	Strongly agreed
Channels reach the owner/decision-maker	1.96	Disagreed
Grand mean	3.14	Agreed

The first research question examined how MTN's choice of communication channels influences dealer strategic alignment. The descriptive results show a mixed but revealing pattern. Dealers strongly agreed that rich channels such as webinars and briefings help them align with complex updates (M = 3.88), and that two-way channels such as calls and question-and-answer sessions allow clarification of expectations (M = 3.96). They also agreed that SMS and email alerts are useful for routine operational changes (M = 3.64), and that training invitations delivered through appropriate channels improve adherence (M = 4.00). These high scores confirm the value of matching channel richness to message complexity.

However, the official dealer portal was rated poorly as a single source of truth (M = 2.00). Respondents also disagreed that MTN provides clear guidance on which channel should be used for which message (M = 1.98), and that MTN's channels reliably reach the owner or key decision-maker (M = 1.96). Dealers further disagreed that over-reliance on WhatsApp leads to misinterpretation (M = 2.10), suggesting that informal channels may be trusted because they are faster and more interactive than some formal alternatives.

Table 3: Regression Analysis: Channel Appropriateness and Strategic Alignment

Predictor	B	SE	B	t	p
Constant	0.593	0.177	-	3.355	.001
Channel appropriateness	1.064	0.064	.745	16.573	< .001
Model fit	R = .745	R^2 = .555	Adj. R^2 = .553	F = 274.7	< .001

The regression result supports the descriptive pattern. Channel appropriateness significantly predicted strategic alignment ($\beta = .745$, $t = 16.573$, $p < .001$). The model explained 55.5% of the variance in strategic alignment ($R^2 = .555$), indicating a strong relationship between perceived suitability of communication channels and the extent to which dealers align outlet-level actions with MTN's strategic intentions.

Interview findings sharpened the interpretation. Two themes emerged. The first was the informalisation of alignment: dealers described WhatsApp groups and direct calls as the

channels through which urgent clarification is most often obtained. The second was routing failure: several interviewees reported that strategic messages sometimes reach outlet staff rather than owners, creating a gap between MTN's intended message and the person authorised to adjust business decisions. These findings support Media Richness Theory by showing that complex directives require interactive channels. They also support Agency Theory because poor routing increases information asymmetry and weakens the principal's ability to align agents with corporate priorities.

Research Question 2

What is the perceived influence of available feedback mechanisms in MTN's downstream communication on customer satisfaction at MTN dealerships in Lagos State?

Table 4: Feedback-Mechanism Indicators and Customer Satisfaction

Indicator	Mean	Interpretation
Official feedback channels resolve issues quickly	3.77	Agreed
Prompt acknowledgement and timelines	1.96	Disagreed
Feedback leads to visible fixes/updates	3.95	Strongly agreed
Slow/absent responses leave customers dissatisfied	3.99	Strongly agreed
Ticket tracking keeps customers informed	3.82	Strongly agreed
MTN shares outcomes/lessons from feedback	2.00	Disagreed
Two-way feedback improves resolution accuracy	4.00	Strongly agreed
Overall satisfaction has improved under current mechanisms	2.05	Disagreed
Training on feedback tools supports retention	3.78	Agreed
Grand mean	3.32	Agreed

The second research question examined the perceived influence of feedback mechanisms on customer satisfaction at dealerships. The descriptive data reveal a paradox. Dealers agreed that official feedback channels such as the portal and hotline help resolve issues (M = 3.77), that ticket tracking helps keep customers informed (M = 3.82), that dealer feedback produces visible system-level fixes (M = 3.95), and that two-way feedback produces more accurate resolutions and happier customers (M = 4.00). These results indicate that MTN has functioning feedback tools and that dealers recognise their potential value.

Nevertheless, the low-scoring items reveal the weakness of the system. Respondents disagreed that escalated complaints are promptly acknowledged with timelines (M = 1.96), that MTN shares feedback outcomes and lessons across the dealer network (M = 2.00), and that customer satisfaction has improved since the adoption of the current feedback mechanisms (M = 2.05). The problem is therefore not merely technological. Dealers may have tools for reporting and tracking, but slow human response and weak learning loops reduce the value of those tools at the customer interface.

Table 5: Regression Analysis: Feedback Effectiveness and Customer Satisfaction

Predictor	B	SE	B	t	p
Constant	-0.533	0.217	-	-2.459	.015
Feedback effectiveness	0.802	0.067	.628	11.981	< .001
Model fit	R = .628	R^2 = .395	Adj. R^2 = .392	F = 143.5	< .001

The regression result shows that feedback effectiveness significantly predicted perceived customer satisfaction (β = .628, t = 11.981, p < .001). The model explained 39.5% of the variance in customer satisfaction (R^2 = .395). This is a meaningful effect, although lower than the variance explained in the channel-alignment model. The difference is logical because customer satisfaction is also affected by other factors such as network quality, pricing, device availability, staff competence and customers' prior experiences with the brand.

The qualitative findings clarify the statistical relationship. The first theme was visibility without closure: dealers can see that a ticket exists, but status visibility is not the same as resolution. The second theme was the macro-micro paradox: dealers perceive that MTN responds to repeated system problems and product errors, but individual customer complaints may remain delayed. This distinction is important because system-level fixes may improve the product environment over time, while customer satisfaction at the dealership counter depends on immediate acknowledgement, credible timelines and case-level closure. The findings align with Participatory Communication Theory, which argues that communication should operate as a two-way process of dialogue, feedback and adaptation.

CONCLUSION

The study concluded that downstream channel communication is a decisive factor in the performance of MTN dealerships in Lagos State. Channel choice significantly influences strategic alignment. Dealers are most aligned when complex messages are delivered through rich, interactive and timely channels, and when routine updates are transmitted through quick, reliable channels. However, the weak ratings of the dealer portal, the absence of clear channel-use guidance and the failure of messages to reach owners directly show that formal systems do not automatically produce alignment. In many cases, alignment is sustained through informal channels and personal clarification rather than through the official channel architecture.

The study also concluded that feedback mechanisms significantly influenced perceived customer satisfaction, but only when they are responsive. Dealers acknowledged the existence of reporting tools, ticket tracking and training; nevertheless, slow acknowledgement, delayed resolution and poor sharing of lessons reduce customer satisfaction at the retail interface. Essentially, effective downstream communication becomes performance-enhancing only when it reaches the right decision-maker, permits clarification, closes feedback loops and generates collective learning across the dealership network.

RECOMMENDATIONS

1. MTN should redesign its dealer-channel architecture around message-channel fit. Complex strategic issues, regulatory changes, incentive revisions and new product launches should be communicated through richer channels such as webinars, live briefings, regional dealer meetings or structured account-manager calls. Routine information such as deadlines, stock alerts and short operational reminders can be distributed through leaner channels such as SMS, email or app notifications.
2. MTN should formalise owner-facing digital communication. Since dealers rely heavily on WhatsApp and quick two-way clarification, MTN should use verified broadcast lists or an

enterprise messaging system that reaches registered business owners directly. This should complement, not replace, the dealer portal by pushing urgent and strategic notices to the people who make outlet-level decisions.

3. The dealer portal should be repositioned as a living single source of truth. It should contain version-controlled updates, searchable product briefs, expiry dates for campaigns, frequently asked questions and a clear distinction between active and outdated directives.
4. MTN should establish service-level agreements for dealer-escalated customer tickets. Complaints involving overcharging, failed activations or unresolved service reversals should carry visible resolution timelines. Escalation progress should be displayed to dealers so that they can communicate credible updates to customers.
5. Feedback should become a collective learning system. MTN should convert recurring dealer complaints and resolved cases into weekly or bi-weekly knowledge-base updates, allowing dealers across Lagos to learn from one another's experiences, reduce repeated complaints and strengthen frontline problem-solving. MTN should also institute quarterly dealer councils across the three Lagos senatorial districts to review communication bottlenecks and incorporate dealer intelligence into channel strategy.

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