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EDITORIAL NOTE

I have the delight and privilege to write as Editor-in-chief of the *Rima International Journal of Education (RIJE)*, an official research publication of the Faculty of Education, Sokoto State University. This edition (Volume 4: No. 4) of the *RIJE* has twenty-six (26) articles from distinguished scholars and educators, poised to report cut-edge research findings and discourse on contemporary educational issues with implications for pedagogy, national and global development.

The dictum of "publish or perish" is in vogue in any worthwhile research-based institutions, hence strict adherence to publications in any reputable and recognized Journal, as such *RIJE* is recognized as complimentary to contemporary dissemination and propagation of knowledge. Therefore, the Editorial Board of *RIJE* wishes to use this medium to solicit well researched articles for publication from teeming population of academics and researchers globally. The Journal would always be subjected to thorough peer review and proper editorial vetting.

Assc. Prof. M.S. Nawait,
Editor-in-chief

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The Editorial Board invites interested scholars and researchers to submit original manuscripts for publication. Published quarterly by the Faculty of Education, Sokoto State University, Sokoto, this journal disseminates relevant research findings in all fields of education. Both empirical and theoretical papers that are articulately written based on contemporary educational issues that have national and international relevance shall be accepted for publication. The manuscript shall not be under consideration elsewhere for publication.

Guidelines for Manuscript Submission

i. **Language**: Manuscripts meant for submission should be written in English language with strict adherence to British standard.

ii. **Paper Size**, Font and Length: Manuscript prepared for submission should be typed in Microsoft Word on A4 paper size using Times New Romans, font size 12 and 1.5-line spacing. The manuscript should not be more than 15 pages including references.

iii. **Title Page**: The title page should capture the title of the manuscript which should not be too lengthy, the author(s) name(s) with surname in Upper Case, institution's affiliation, current mailing address, valid e-mail address, Phone No(s) and full postal address of the main author and co-authors.

iv. **Abstract**: Manuscripts must be accompanied with an abstract of not more than
200 words comprising essential components of the manuscripts. Avoid citations in the abstract. After the abstract, the authors should provide maximum of 5 key words.

v. **Organization**: The manuscript should be explicitly presented under various headings and sub-headings. The ideas should be properly organized. Coherent and sequential. More importantly, the following should be made conspicuous while preparing empirical papers: **Introduction** (indicating rationale for the study, review of related literature, problem statement, and purpose of the study), **Methodology**, **Results**, **Discussion**, **Conclusion** and **Recommendations**.

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vii. **Arrangement of Text-Quotations**: Indication of 1.5 in both left and right should be used for a particular quotation that is up to 40 words or more. Hence, the page number of the quotation should be

provided in bracket at the end of the quoted words or passages.

viii. **Findings/Results**: This should be clearly presented in tables and figures with appropriate headings/sub-heading. Do not restate your research questions or hypotheses under this section.

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TABLE OF CONTENTS

Rima International Journal of Education (RIJE), Vol. 4 Issue 4: Sept 2025; Page: 1-13 ISSN: 2756 - 6749

Relationship Between Learning Environment and Secondary School Students' Academic Performance in Nasarawa North Senatorial District of Nasarawa State-Nigeria

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Abstract

This study examined the relationship between learning environment and academic performance of secondary school students in Nasarawa North Senatorial District of Nasarawa State. The design for the study was correlational research design. The population for the study comprised of all public secondary schools SS2 students in the study area. Through random sampling technique, 384 students were selected for the study. The instrument for data collection was a questionnaire. The instrument was validated and validity index of 0.88 was obtained. A pilot study was carried out and reliability coefficient of 0.74 was obtained. Mean and standard deviation were used to answered the research questions, while chi square statistics was used to resolved the hypotheses at 0.05 level of significance. The findings revealed that there is a significant relationship between facilities in the learning environment and students' academic performance in public senior secondary schools in Nasarawa North Senatorial District of Nasarawa State. It was further revealed that there is a significant relationship between students' attitude to learning in learning environment and their academic performance in public senior secondary schools. it was concluded that students' academic performance in Nasarawa North Senatorial District depends on the state of learning environment. Recommendations were made that the government should inject more funds into the educational system for the procurement of teaching and learning facilities such as building of modern classrooms, laboratories, libraries and furniture among other recommendations.

Keywords: Relationship, Learning, Environment, Academic Performance

Introduction

Education is the bedrock of the development of any nation. It is on this premise that government invest heavily in the education of her citizens. Secondary education, a sub set of the educational level, is very necessary in

human capital formation. It is the very base from which tertiary institutions draw their major students for admission into their different programme. It therefore presupposes that the provision of qualitative education is the basis for the attainment of the goals of secondary education. However, to attain this goals the learning environment must take a proper outlook for the furtherance of the overall educational objectives.

Many scholars have argued that learning environment are variables that can affect students' academic achievement, including performance in examination. Crowe (2023) stated that learning environment encompasses learning resources and technology, means of teaching, modes of teaching, and connections to society and global contexts. The term also includes human behaviourial and cultural dimensions, including the vital role of emotion in learning. Contemporary learners deserve learning spaces that meet them individual and collective needs. To meet this challenge, educational leaders must provide physical and cultural environments that are empowering and engaging (Li et al., 2021). Learning environments vary from classroom to classroom and context to context each with unique elements. Learning environment is composed of some components that influence the students' learning curve. These components according to Omar and Awang (2023) includes people, teaching materials, technical tool and learning resources, curriculum, training and instruction, and physical environment/learning space. The people are the individuals that affect the student directly or indirectly through connection or relationship which can contribute to students' growth and success in their career aspect. The teaching materials, technical tools, and learning resources are the teaching materials highly advanced tools or others instructional resources that are aligned with the curriculum as a part of student learning support. The curriculum, training, and instruction are the core foundations of the learning process, they influence one another and play vital roles to facilitate the flow of knowledge and delivery of instructional content/curriculum. The physical environment/learning space refers to the physical setting of the learner's environment which should evoke positive responses and hold the interests of those who inhabit it (Omar and Awang, 2023). They also identified some important factors that may affect learning process to include Intellectual factor which refers to the individual mental level. Learning factors are factors owing to faulty methods of work or study, and narrowness of experimental background which may affect the learning process. Physical factors include health, physical development, nutrition, visual and physical defects, and glandular abnormality. Mental factors are

attitudes like interest, cheerfulness, and open mindedness that are important in the development of personality. Personal factors, such as instincts and emotions, and social factors, such as cooperation and rivalry, are directly related to a complex psychology of motivation. The teacher as an individual personality is an important factor in the learning environment. They are key factors that create a favourable teaching-learning milieu that will make the instructional process easy, enthusiastically adaptable and useful (Closs et al., 2022). The way in which his personality interacts with the personalities of the pupils helps to determine the kind of behaviour which emerges from the learning situation (Gao et al.s, 2020). Environmental factors like classrooms, textbooks, equipment, school supplies, and other instructional materials are the physical conditions needed for learning Oduwaye (2011). Adewuyi (2012) observed that before students can succeed academically, they must feel safe, both physically and mentally, and to have a safe learning environment, students must feel welcomed, supported, and respected. Personalizing learning helps students develop skills including thinking critically, using knowledge and information to solve complex problems, working collaboratively, communicating effectively, learning how to learn, and developing academic mind sets that would greatly increase students' engagement. More so, students must feel connected to teachers, staff, and other students. Schools can nurture these connections by focusing on students' social and emotional learning (SEL). Students' must also feel supported by all those connected to their learning experience like teachers, classmates, administrators, family, and community members for a higher academic feat (Rohana, 2009). Productive learning environments are crucial to students' academic, emotional and social success in school. A conducive learning environment doesn't just happen on their own or by chance. They should be created through conscious procedures like interacting with students in a positive manner, exhibiting positive behaviours that would promote learning activities in the learning environment (Dinh et al., 2022). The school learning environment should be well structured, organized, studied and well managed for the attainment of the secondary school education goals and to enhance students' academic performance.

The issue of poor academic performance of students in Nigeria has been of much concern to the government, ministry of education, parents, teachers and even student themselves. The quality of education not only depends on the teachers as reflected in the performance of their duties, but also in the effective co-ordination of the school learning environment. The physical characteristics

of the school have a variety of effects on teachers, students and the learning process, poor light, noise, high level of carbon dioxide in classroom, and inconsistent temperatures make teaching and learning difficult. It has been observed that poor maintenance and ineffective ventilation systems leads to poor health among students as well as teachers, which lead to poor performance and higher absentee.

These factors can adversely affect students' behavior and lead to higher levels of frustration among teachers and poor learning attitude among students. For education in the secondary school to be effective the environment needs to be conducive for learning, allowing the student space and time to interact within the learning and teaching process. Creating and maintaining stimulating learning environment can be achieved through effective classroom organization, interactive and a whole display of climate of innovation.

The school learning environment is a well-structured, organized and planned place or setting where teaching and learning occur. The place or setting can be in the classroom situation, library (school library and classroom library), school laboratory where experiment and practical works are carried out by students, technical workshop. Thus, the school or learning environment remains an important area that should be studied and well managed.

Consequently, there are factors affecting student's academic performance in learning environment. Shamaki (2015) and Duruji (2014) asserted that learning environment that is not free of barriers or noise, gas, smoke, pollution and so on can constitute health hazard, which in turn affect or reduce student's concentration in learning environment where by affecting their academic performance. Markets and garages located near schools have always posed a threat to student's academic performance. Noise and pollution from these sources have always endangered student life and concentration.

Other factors according to Shamaki (2015) and Duruji (2014) complementing environment and socio-economic factors to produce high academic achievement and performance include good teaching, counseling, good administration, good building. Dilapidating buildings, lack of mental stimulating facilities that is characterized with low or no sitting arrangement will also be destructive. However, they lamented that the innovation environment do stimulate head start learning and mental perception, not only that, it has also been proved that students that comes from stimulating

environment with laboratory equipment or those that are taught with rich instructional aids, pictures and allowed to demonstrate using their functional peripheral nerves like eyes, hands and sense of taste performed better than those trained under theoretical and canopy of abstraction.

Shamaki, (2015) conducted a study to determine the influence of learning environment on students' academic achievement at senior secondary school level in Yobe state, Nigeria and found a significant difference between the mean performance of students taught in an ideal learning environment and that of students taught in a dull learning environment. Adamu (2015) examined the impact of learning environment on the Performance of Students in public secondary schools in Taraba State, Nigeria and the findings revealed a significant difference in the performances of the two groups (Experimental and Control) implying that a classroom building; class with adequate furniture; class with small class population and the use of instructional materials has positive impact on the performance of students in junior Secondary schools. In a related development, Opeyemi, (2020) conducted a study to examine how school environment influence students' academic performance in junior secondary schools in Ogun State. The result of the study indicated that students from a school with adequate facilities, good teachers and favourable environment perform better than those from schools with fewer facilities, unqualified teachers and less enabling environment. In another research by Duruji (2014), which examines the impact of learning environment on students' performance in external examination in secondary schools in Ota, Nigeria considering factors such as school facilities, class size, school location and school plant planning, aesthetics, maintenance culture, sanitation, conveniences. The study established that" the state of learning environment and quality of infrastructure, together with the extent to which they are being maintained has a strong bearing to academic performance among students". Furthermore, Ezike (2018) investigated classroom environment and students' academic interest as correlates of achievement in Senior Secondary Chemistry students in selected Public Secondary Schools in Ibadan, Oyo State, Nigeria. The result showed significant relationships between classroom environment and academic achievement, while combined contribution of classroom environment and academic interest was equally significant. Gilavand (2016) in a study whose aim is to investigate the impact of environmental factors (schools' open space, noise, lighting and paintings in educational institutions) on learning and academic achievement of elementary students, found that environmental factors (appropriate colouring, lighting of educational

environment and schools' open space) has impact on learning and academic achievement of elementary school students.

The innovation environment does stimulate head start learning and mental perception, not only that, it has also been proved that students that comes from stimulating environment with laboratory equipment or those that are taught with rich instructional aids, pictures and allowed to demonstrate using their functional peripheral nerves like eyes, hands and sense of taste performed better than those trained under theoretical and canopy of abstraction. This study therefore focuses on the relationship between learning environment and academic performance of secondary school students' in Nasarawa North Senatorial District of Nasarawa State.

Statement of Problem

The learning environment in secondary schools are characterized with dilapidated classrooms, equipment and facilities which have effect on students' academic performance. Some of the classrooms are over populated with students beyond the normal capacity of the classroom. In this case, the teachers find it difficult to communicate to large population of students and move freely due to lack of space in the classroom. Students have poor sitting arrangement due to over congested students in the sitting chairs in the classroom. Moreover, the attitude, motivation, and interest exhibited by learners in learning environment has constituted a lot of problem, such as his readiness to learn, his entry behavior, is he/she interested in what he/she is expected to learn? Shortage of learning facilities, negative attitude to learning and general intelligence could have effect on students' academic performance in the learning environment. What then is the relationship between learning environment and public secondary school students' academic performance in Nasarawa North Senatorial District of Nasarawa State?

Purpose of the Study

The objectives of this study are to:

1. investigate the relationship between facilities in the learning environment and students' academic performance in public secondary schools in Nasarawa North Senatorial District of Nasarawa State.

2. examine the relationship between the students' attitude in the learning environment and their academic performance in public secondary schools in Nasarawa North Senatorial District of Nasarawa State.

Research Questions

1. What is the relationship between facilities in the learning environment and students' academic performance in public secondary schools in Nasarawa North Senatorial District of Nasarawa State?
2. What is the relationship between the students' attitude in the learning environment and their academic performance in public secondary schools in Nasarawa North Senatorial District of Nasarawa State?

Research Hypotheses

1. There is no significant relationship between facilities in the learning environment and students' academic performance in public secondary schools.
2. There is no significant relationship between students' attitude to learn in learning environment and their academic performance in public secondary schools.

Methodology

This study employed the correlational research design to investigate the relationship between learning environment and secondary school students' academic performance in Nasarawa North Senatorial District of Nasarawa State. The population of this study comprised of all students in public senior secondary school class two (SS2) in Nasarawa North Senatorial District of Nasarawa State. The instrument for data collection was questionnaire. The constructed questionnaire has two main parts, Section A and B. Section A measures the personal data of the respondents such as name of school, gender, class etc. While section B contains twenty (20) items which were structured to elicit information on the relationship between learning environment and public secondary school students' academic performance in Nasarawa North of Nasarawa State. The instrument was personally administered by the researcher. A random sampling technique was employed to select 384 students for the study in fifteen public senior secondary schools. The instrument was face validated by experts in measurement and evaluation from Federal University of Lafia to logical validity of 0.88. Pilot study was conducted to

further assess the reliability of the instrument, resulting to a reliability index of 0.074. Chi-square statistical test was used to resolved the hypotheses at a 0.05 level of significance, providing insights into the relationship between learning environment and students' academic performance in public senior secondary schools in Nasarawa North Senatorial District of Nasarawa State.

Results

Research Question 1: What is the relationship between facilities in the learning environment and students' academic performance in public secondary schools in Nasarawa North Senatorial District of Nasarawa State?

Table 1: Mean and Standard Deviation of the relationship between facilities in the learning environment and students' academic performance in public secondary schools

S/N	Responses	N	Mean	SD	Df
1	Agreed	370	112.3840	12.4368	382
2	Disagreed	14	101.4612	16.1248	

Table 1 revealed the mean and standard deviation of responses of respondents that agreed (M=112.3840, SD=12.4368) and those that disagreed (M=101.4612, SD=16.1248). The mean of respondents agreed is higher than those that disagreed

Research Question 2: What is the relationship between the students' attitude in the learning environment and their academic performance in public secondary schools in Nasarawa North Senatorial District of Nasarawa State?

Table 2: Mean and Standard Deviation of the relationship between students' attitude in the learning environment and their academic performance in public secondary schools

S/N	Responses	N	Mean	SD	Df
1	Agreed	374	121.4326	13.2468	382
2	Disagreed	10	106.2548	14.4126	

Table 2 revealed the mean and standard deviation of responses of respondents that agreed (M=121.4326., SD=13.2468) and those that disagreed (M=106.2548, SD=14.4126). The mean of respondents agreed is higher than those that disagreed

Hypothesis

There is no significance relationship between facilities in the learning environment and students' academic performance in public senior secondary schools.

Table 3: Chi-Square analysis on the relationship between facilities in the learning environment and students' academic performance in public senior secondary schools

S/N	Responses	Observed Frequency	Expected Frequency	X^2 Cal	X^{2tab} Cal	Df	P-Val	Alpha Level	Decision
1	Agreed	370	384	249.21	14.067	382	0.02	0.05	Sig
2	Disagreed	14							

The table above revealed that the X^2 calculated value of 249.21 is higher than the X^2 table value of 14.067. p-value of 0.02 is less than the alpha level of significance 0.05 at 382 degree of freedom. The null hypothesis is therefore rejected. This implies that there is a significant relationship between facilities in the learning environment and students' academic performance in public senior secondary schools in Nasarawa North Senatorial District.

Hypothesis Two: There is no significant relationship between students' attitude to learning in the learning environment and their academic performance in public senior secondary schools.

Table 4: Chi-Square analysis on the relationship between students' attitude to learning in the learning environment and their academic performance in public senior secondary schools

S/N	Responses	Observed Frequency	Expected Frequency	X^2 Cal	X^{2tab} Cal	Df	P-Val	Alpha Level	Decision
1	Agreed	374	384	249.822	14.067	382	0.02	0.05	Sig
2	Disagreed	10							

The table above revealed that the X^2 calculated value of 249.822 is higher than the X^2 table value of 14.067. p-value of 0.02 is less than the alpha level of significance 0.05 at 382 degrees of freedom. The null hypothesis is therefore rejected. This implies that there is a significant relationship between students' attitudes to learning in the learning environment and their academic performance in public senior secondary schools in Nasarawa North Senatorial District.

Discussion

The first hypothesis revealed that there is a significant relationship between facilities in the learning environment and public senior secondary school students' academic performance. This implies that when facilities are available and meaningfully utilized in the learning environment it can boost students' academic performance. This finding is in agreement with the finding of Shamaki (2015) and Duriji (2014) who in their study confirmed a strong and positive relationship between quality of school facilities and students' academic achievement. This finding shows that facilities in the learning environment relates to academic performance of students.

The result from the second finding revealed that there is a significant relationship between students' attitude to learning and their academic performance in public senior secondary schools. This implies that the attitude students show or display toward learning has tremendous effect on their academic achievement. This finding is in line with Ezike (2018), who stated that positive attitude of students toward learning may be both the cause and the result of success, whereas negative attitude is demonstrated by students due to lack of success. It was stressed further that positive attitude do not necessarily bring academic success if these attitudes are not accompanied by effective strategies that enable students to take advantage of instructional opportunities and if they are not clearly presented to them. This shows that students' attitude to learning relates to their performance.

Conclusion

Based on the findings, the following inferences were drawn:

1. It was evident that there is a significant relationship between facilities in the learning environment and students' academic performance in public senior secondary schools in Nasarawa North Senatorial District of Nasarawa State.
2. It was further proved that there is a significant relationship between students' attitude to learning in learning environment and their academic performance in public senior secondary schools.

Recommendations

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

1. The government should inject more funds into the educational system for the procurement of teaching and learning facilities such as building of modern classrooms, laboratories, libraries and furniture.

2. Parents should show active interest in their children's education by providing them with rich instructional materials and also make the home environment conducive for learning by ensuring homework habit, parental support and guidance, intellectual stimulations etc.

3. Students who show positive interest and attitude in learning should be encouraged by parent and teachers while those who display negative attitude should be dissuaded.

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Prospects and Impediments of the Application of Artificial Intelligence for Enhanced Open, Distance and Flexible Education in Nigeria

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Abstract

Artificial Intelligence (AI) is revolutionizing various facets of human life, education in particular. As AI-driven technologies permeate different sectors, the educational landscape, particularly in open, distance, and flexible education (ODFE), is experiencing transformative changes. This paper discussed the critical role and impact of AI on open, distance, and flexible education, highlighting both the prospects and challenges associated with its integration. AI has the potential to significantly enhance ODFE by personalizing educational experiences, boosting student engagement, and delivering real-time feedback. However, the adoption of AI in ODFE is not without hurdles. Some of the key challenges identified in the discussion includes concerns over data privacy, inadequate knowledge and training, algorithmic bias, insufficient technological infrastructure, and ethical considerations. This paper illuminates the potential benefits of AI in ODFE while also addressing the critical challenges that must be navigated to ensure optimal benefits of this phenomenal dynamic technology.

Keywords: Artificial intelligence (AI), open, distance, flexible education, challenges. Prospects

Introduction

Technological advancements have consistently driven progress, transforming various aspects of human life. In recent decades, society has experienced significant technological revolutions across multiple sectors, impacting production, employment, and daily activities (Albuquerque, 2019). One of the most notable developments is the Fourth Industrial Revolution (4IR), which has been the focus of extensive research and is considered a strategy to improve competitiveness in business production (Gázquez et al., 2021; Schwab, 2017; Xu et al., 2018). Described in 2016 by Klaus Schwab, the founder of the World Economic Forum, 4IR refers to the integration of the

offline and online worlds, driven by innovations such as the Internet of Things (IoT), big data, and Artificial Intelligence (AI), among others. These technologies are reshaping industries and influencing the global job market (Eberhard et al., 2017).

AI has been defined in various ways depending on the context of its application. While some experts described it as the creation of intelligent agents that perceived their environment and perform tasks to maximize success (Russell & Norvig, 2019; Auwal et al., 2023; Ismail et al., 2024). Others view AI as technology facilitating interaction between humans and machines, whether through physical integration or virtual connections (Kaufman, 2020). AI is also understood as the study of how to enable computers to perform tasks that currently require human intelligence (Ertel, 2018). Despite concerns about the potential for AI to surpass human control, it is important to remember that these technologies are products of human creation, designed to solve specific challenges (Pinto, 2005). AI has been used in educational settings for over 30 years, though its effects on teaching and learning in higher education are still being explored. Research has largely focused on four areas: Profiling and Prediction, Assessment and Evaluation, Adaptive Systems and Personalization, and Intelligent Tutoring Systems (Zawacki-Richter et al., 2019). AI has demonstrated potential in providing greater support and personalized tutoring for students. However, concerns about ethical issues, such as data privacy and the potential threat to educators' employment, persist (Peters & Jandric, 2019; Wogu et al., 2019; Zawacki-Richter et al., 2019).

In open, distance, and flexible education, AI's applicability is particularly significant. As we all recognize, distance education inherently relies on a technological framework, which can be effectively enhanced by AI through Machine Learning (ML) techniques, and specifically Deep Learning (DL) methods (Yu et al., 2017). DL allows for the analysis of complex, multi-layered data, enabling AI to utilize the vast amount of information available in the ODFE learning environments to improve educational outcomes (LeCun et al., 2015). For instance, AI can track students' engagement, predict academic performance, and personalize learning experiences. Since 2016, when the first AI-powered teaching assistant was introduced at the Georgia Institute of Technology (Goel & Polepeddi, 2016), AI-driven tutoring systems have been increasingly adopted worldwide. These systems can handle routine tasks such as grading and providing assistance in online forums, allowing educators to

focus on more complex and creative activities. However, recent evidence suggests that the implementation of AI technology may lead to a reduction in teaching positions (Kim et al., 2020; Melim & Moraes, 2021). A situation that may not be entirely true. Despite these progress, significant challenges arise. Concerns regarding data privacy, algorithmic bias in decision-making processes, and the ethical implications of AI implementation loom large (Kizilcec & Halawa, 2022). The reliance on AI for educational tasks also raises questions about the future roles of educators and the potential for depersonalization in student-teacher interactions (Liang & Wang, 2023). As AI continues to play wider roles in education, addressing these challenges will be crucial to ensuring that its implementation enhances, rather than diminishes, the quality of open and distance learning. Against this background, this paper aims to identify the vast potentials of AI in enhancing the ODFE as well as highlight the associated impediments to these positive strides. By so doing, the paper contributes to the growing discourse and rapid transformation of the education landscape by emerging technologies particularly the Artificial Intelligence induced revolution. Consequently, informing policy and theoretical decisions in that regard.

To provide a clearer contexts for the discussion on the influence of AI on Open, Distance and E-Learning, it is pertinent to understand the different conceptions of AI the human-made intelligence in the Literature.

AI: A human- made Intelligence

The Internet has played a pivotal role in the development and integration of artificial intelligence (AI) into all facets of everyday life (Huawei Technologies), sparking extensive research across various contexts and disciplines. AI, as a concept, has been defined differently by various scholars. The ODFE as always requires conceptual/terminological clarification (Jegede, 2024), for instance, Moumita and Thirugnanam (2021) describe it as "machine-based systems that are guided by human-defined goals, make predictions, make recommendations, and make decisions based on them that affect real or virtual contexts" (p. 23). Similarly, Auwal, Yunusa, and Salisu (2023) defined AI as "a branch of computer science that makes computers mimic human behavior to help perform better in science and technology." Patricia and Joan (2024) further elaborate that AI involves "computer systems that integrate processes mimicking human intelligence, such as learning, adapting, analyzing, adjusting, correcting, and using data to address complex

issues." Evidently, from the foregoing definitions it can be concluded that AI is fundamentally rooted in human intelligence and seeks to replicate human functions by processing large data sets, creating machines capable of tasks requiring human intelligence, and designing self-learning systems (Moumita & Thirugnanam, 2021). AI's advancement is considered critical for supporting distance learning and continuing the education processes (Gulnora, Farida, & Sayidolim, 2022). AI encompasses various branches of learning, including machine learning, which utilizes algorithms to identify patterns in educational data through recurring training (Sdenka et al., 2023), relying on repeated data processing to distinguish between patterns (Patricia & Joan, 2024). Automation, as a technological tool, offers solutions to everyday and educational challenges, enhancing learning speed, response, and overall efficiency (Rahman et al., 2023). Deep learning represents an advanced stage of AI, extending beyond machine learning by using large data sets to simulate and predict educational outcomes (Sdenka et al., 2023). Deep learning is crucial for distance education, as it organizes and arranges various forms of knowledge, emphasizing fundamental importance and involving analytical abilities, cross-referencing, imaginative reconstruction, and free thinking (Rahman et al., 2023).

Natural Language Processing (NLP) refers to a computer's ability to understand, interpret, and generate human language, including speech and text (Abdulaziz, & Khalifa N., 2023). Lastly, computer vision is defined as the ability of computers to analyze and interpret visual information, such as images and video (Abdulaziz, Abdel Magid, & Khalifa N., 2023).

Open, Distance, and Flexible Education (ODFE)

Open, Distance and Flexible education (ODFE) is considered as old as human existence (Jegede, 2024). These form of education offerings has witnessed transformative evolution from correspondent, postal education, distance learning it has now evolved to a more personalized learning system with an advantage of borderless learning opportunity and learning at massive scale. In addition, the recent Corona Virus disruptions of the education sphere (Yunusa et al, 2021) has made ODFE the most viable learning model of the present time. Owing to its dynamism and continual evolution (Bozkurt & Zawcki-Richter, 2021). ODFE does not require enclosed space for learning to take place, it however requires the medium of communication enabled by technology and the internet underscoring the convergence of ODFE and

technology. The ‘open’ in distance learning refer to the flexibility in terms of enrolment criteria, the programme offerings, age, previous level of academic attainment etc. while ‘distance’ defines the separation between the student and the teacher which is one of the key challenges of the model. Moore (2009) refer to it as ‘Transactional distance’

Over the years, the world has seen a shift towards distance education (Yunusa et al., 2021), a mode of learning that contrasts with traditional face-to-face education. Initially limited to a few developed contexts due to the high costs, infrastructure needs, and the adoption of distance education technologies. This form of education served as an alternative or complement to traditional methods. However, global policies promoting technology in education have spurred its adoption, making knowledge more accessible and education available to all (Anderson et al., 2021). The flexibility of distance education, along with the rise of learning management systems, has facilitated its growth, expanding interaction among teachers, students, and educational content. The universality of the concept of open, distance, online and flexible education (hereafter as ODFE) is still shrouded in ambiguity (Yunusa, 2021; Singh & Thurman, 2019). Nonetheless, ODFE is the most significant innovation in the ream education that offers learners convenient choices for learning.

In the wake of the COVID-19 pandemic, distance education was optional and limited. However, the pandemic experience a necessitated sudden shift, as a preventive measure to curb the spread of the virus, and since then, it has become an integral part of educational systems worldwide, alongside traditional face-to-face learning (Magdalena, Magdalena, & Klaudia, 2023). Researchers define distance education as "education that uses computer technologies and learning platforms to provide education to students virtually, supporting regular interaction between students and teachers, either synchronously or asynchronously" (Patricia & Joan, 2024). This system offers features that enhance the educational process, ensuring its continuity and broad accessibility, enabling many students to access educational opportunities regardless of geographical or financial constraints (Gulnora, Farida, & Sayidolim, 2022).

Distance education primarily includes two types: asynchronous and synchronous. Asynchronous distance education allows interaction between teachers and learners at any time, often through educational platforms, recorded lectures, or visual programs. While, Synchronous distance education,

on the other hand, requires real-time interaction, such as attending live lectures online at scheduled times. Additionally, a hybrid model combining synchronous and asynchronous elements has become common, particularly in regions newly adopting distance education (Magdalena, Magdalena, & Klaudia, 2023).

Enhancing Open, Distance, and Flexible Education with AI

As human affairs become more digitalised, navigating the digital space require cutting edge technology, one of which is AI. As Jegede (2024) noted. Today's world including teaching and learning in the ODFL cannot do without navigating the digital landscape. Given this imperative, it is important to highlight how AI is impacting the education offering in ODFE. Moreover, the everchanging dynamics of the 21st century learner requires personalized, flexible, ubiquitous and socially collaborative educational experiences which is enabled by transformative emerging technologies such as the AI. Research shows that AI has significantly influenced open, distance, and flexible education. Ismaila et. al., (2024) posit that the significance of AI has inspired the creation of different resources including tools, curricula materials as well as influenced rethink of teaching approaches and methodologies. Utku (2018) argues that AI's ability to solve complex problems and simulate human intelligence has helped make distance education more effective through applications like machine learning.

AI impacts distance education in several ways, such as the use of intelligent tutoring systems, virtual learning assistants, and collaborative learning platforms (Sdenka, Kejiang, & Xinyun, 2023). Additionally, AI enhances decision-making for teachers using algorithms that provide real-time data on classroom activities, allowing immediate responses to students' needs (Patricia & Joan, 2024). Overall, AI is reshaping education, particularly in open and distance learning context, by automating tasks, personalizing learning experiences, and offering intelligent support, thus increasing students' access to educational opportunities. In broader context, AI impacts ODFE in the following ways:

Intelligent Tutoring Systems (ITS): ITS are becoming more common in distance education because they can offer students real-time feedback, answer questions, and provide guidance on difficult topics. These systems adapt to individual student needs, creating personalized learning experiences by

analyzing data on students' progress and performance (Ismail, Muhterem, Hanni, & Sanna, 2022).

Personalized Learning: AI-powered platforms can analyze student data, including learning styles, progress, and preferences, to customize educational content. This personalized approach ensures students receive instruction suited to their needs, leading to better learning outcomes.

Automated Grading: AI can handle time-consuming tasks like grading and assessments, allowing teachers to focus on providing meaningful feedback. AI tools can also analyze student performance to identify areas of difficulty and offer targeted support.

Accessibility and Inclusivity: AI can make education more accessible for students with disabilities by providing tools like real-time captioning, lecture transcription, and alternative text for images, ensuring all students have equal opportunities to succeed.AI enables access to learning materials through cloud platforms, allowing students to study from anywhere with internet access (Magdalena, Klaudia, & Magdalena, 2023).

Gamification: Gamification, an AI-driven approach, enhances distance education by using data and reasoning techniques in games to improve skills. This interactive approach encourages student participation and collaboration, leading to better results (Magdalena, Klaudia, & Magdalena, 2023).

Immediate Feedback: Feedback is a crucial part of the learning process. AI provides quick and objective feedback, helping students identify areas for improvement and offering opportunities for correction (Anderson et al., 2021). In conclusion, AI has become an essential part of education, transforming traditional methods. Students now use digital tools instead of paper, write through touch or voice, and enjoy personalized learning experiences. AI has also improved research by providing access to reliable sources and protecting researchers' rights, creating a secure environment for distance education. Despite these benefits, there are concerns about AI's use in education, especially for children. UNICEF highlights issues like bias, data protection violations, and the risk of worsening the digital divide.

Impediments to Effective Artificial Intelligence Application in ODFE

Despite the critical role of AI in ODFE, several concerns should not be ignored. Concerns such as privacy and security of student data are paramount, as AIsystems rely on substantial amounts of student information. Ethical and responsible AI usage is also a concern that is affecting ODFE Moreover, reduced in-person interaction between students and teachers can hinder the education process, as interaction is crucial for measuring learner satisfaction and learning outcomes (Yunusa & Umar, 2021). Interaction helps AI systems identify and address specific student needs (Kyoungwon et al., 2021). Over-reliance on AI for academic tasks can reduce human interaction and personaliz ed attention.

Other impediments include insufficient knowledge and training in technologic al techniques and automated learning basics, which can hinder interaction and content delivery. Weak infrastructure, such as inadequate technical support an d limited Internet availability, can also obstruct AI's effectiveness in distance education (Ismail et al., 2022). Additionally, AI systems' collection and proces sing of data make privacy protection crucial, as weak data quality can lead to i naccuracies (Abdulaziz et al., 2023). Ethical concerns such as privacy, reduced independence, and the risk of bias and plagiarism must also be addressed (Pat ricia & Joan, 2024). In a broader sense, the impedments to ODFE as succintly captured by Jegede (2024) include but not limited to geographical, economic, social, political, physical, emotional or psychological.

Conclusion

AI is revolutionizing open, distance, and flexible education. By personalizing l earning experiences, providing intelligent tutoring, automating tasks, and impr oving accessibility, AI can foster effective, inclusive and equitable education g lobally. As technology advances, it is crucial to enhance rather than replace th e human element of education.AI has alreadyplayed a significant role in advan cing distance education,offering personalized experience tailored to learners' n eeds and expanding learning opportunities via the Internet and virtual classroo ms. To sustain progress, countries must strengthen technical infrastructure, inc rease Internet accessibility, and implement training programs for educators an d learners in AI technologies (Ismaila et al., 2024).

Suggestions and Future Direction

As artificial intelligence (AI) continues to shape the landscape of open, distance, and flexible education (ODFE), it is essential to address existing challenges while exploring opportunities for improvement. Ensuring ethical AI adoption, strengthening infrastructure, and enhancing human-AI interaction will be critical in fostering an inclusive and effective learning environment. The following suggestions provide actionable strategies to mitigate impediments and maximize the potential of AI in ODFE. This includes:

i. Developing robust data protection policies and encryption protocols to safeguard student data.

ii. Implementing AI-driven cybersecurity measures to detect and prevent data breaches.

iii. Educating and mobilising students and educators on ethical data usage and privacy rights.

iv. Designing AI systems that complement, rather than replace, teacher-student interactions.

v. Integrating AI tools that facilitate virtual discussions, mentorship, and real-time feedback.

vi. The use of AI to personalize learning paths while maintaining opportunities for direct human engagement. Implementing targeted training programs for educators to improve AI literacy and integration skills.

vii. Developing AI-driven learning modules to assist teachers in mastering AI-enhanced pedagogy.

viii. Encouraging interdisciplinary collaboration to bridge the gap between AI developers and education practitioners, and

ix. Investing in digital infrastructure, including affordable internet access and reliable technical support.

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Mental Health Education in Human-Centered Technological Innovation in Higher Education in Nigeria

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Abstract

Mental health education in higher education institutions is crucial for fostering awareness, reducing stigma, and promoting well-being among students. In Nigeria, where mental health issues often remain under-discussed due to cultural stigma, human-centered technological innovations offer a transformative approach to mental health education. This study explores the effectiveness of digital tools designed to enhance mental health literacy, attitudes, and engagement among university students in Nigeria. Using a mixed-methods approach, the research assesses the impact of technology-driven mental health education on students' knowledge, attitudes, and behavioral changes. The findings suggest that gender, age, and academic discipline significantly influence the effectiveness of mental health interventions. Female students and younger age groups (18-25 years) exhibited more significant improvements in mental health literacy and positive shifts in attitudes toward mental health. Despite these differences, all students, regardless of discipline, demonstrated enhanced understanding and engagement with mental health content. The study underscores the importance of tailoring interventions to address gender and age disparities and highlights the need for accessible, inclusive digital platforms. It also calls for a broader integration of mental health education into university curricula, with policy support to foster a more supportive environment for student well-being. Ultimately, human-centered technological innovations hold substantial promise for advancing mental health education in Nigeria's higher education system, but further efforts are needed to ensure equitable access and long-term impact.

Keywords: Mental Health Education, Human-Centered Technological Innovation, Higher Education, Nigeria, Mental Health Literacy

Introduction

Mental health education has become an increasingly critical component of higher education, especially as institutions in Nigeria adapt to rapid

technological transformations. The intersection of human-centered technological innovation and mental health awareness offers a new paradigm for addressing the psychological well-being of students and faculty within academic environments. As technological advancements reshape educational delivery, including through online learning, AI integration, and digital communication tools, there is a pressing need to ensure that these innovations are designed with empathy, inclusivity, and psychological resilience in mind (Olanrewaju et al., 2021).

Human-centered design prioritizes user needs and experiences, making it a vital framework for embedding mental health considerations into technological systems used in Nigerian universities (Ibrahim & Ajayi, 2020). The rise of mental health challenges such as anxiety, depression, and stress among students has been documented as a growing concern, exacerbated by academic pressure, economic hardship, and limited support structures (Oginni et al., 2020). Thus, there is a compelling argument for integrating mental health education into the curriculum and digital learning ecosystems in a deliberate and innovative manner.

Mental Health Education is an essential component of overall health promotion, aimed at increasing awareness, understanding, and knowledge about mental health issues, reducing stigma, and promoting psychological well-being across all stages of life. It equips individuals with the skills needed to cope with stress, build resilience, and seek help when needed. According to World Health Organization (WHO, 2022), mental health education plays a vital role in improving emotional well-being and preventing mental disorders by promoting awareness, support, and intervention strategies at both individual and community levels. Jorm et al. (1997) define mental health education as a form of public education that seeks to improve the knowledge and beliefs of the general population about mental disorders to aid their recognition, management, or prevention. This includes initiatives like Mental Health First Aid and psychoeducational programs. Kutcher, Wei, and Coniglio (2016) emphasize that mental health education should be school-based, culturally appropriate, and evidence-informed, focusing on increasing mental health literacy to improve outcomes for young people and reduce long-term health burdens. Barry and Jenkins (2007) argue that mental health promotion and education are not only about preventing mental illness but also about fostering positive mental health through social and emotional learning, community programs, and public policy.

Human-Centered Technological Innovation (HCTI) refers to the design, development, and implementation of technologies that prioritize the needs, experiences, and well-being of individuals throughout the creation process. Unlike traditional technological development, which often focuses on technical specifications and efficiency, HCTI seeks to create solutions that enhance the quality of life, support human agency, and are accessible and inclusive. Norman (2013) defines human-centered design as an approach where the goals, needs, and capabilities of users are the main focus when designing technology. It emphasizes empathy and user feedback to create products that are not only functional but also resonate with users on a personal level. According to Brown (2009), human-centered innovation involves interdisciplinary collaboration to generate solutions that are grounded in a deep understanding of the people who will use the technology. It aligns the design process with the emotional and social aspects of users, making the technology more intuitive and responsive. Martin (2007) further elaborates that human-centered innovation is a broader framework that integrates both technological advancements and social innovation. It ensures that new technologies are developed with a sense of responsibility to society, focusing on creating meaningful and sustainable impacts.

In Dourish (2001)'s view, human-centered innovation also involves considering the cultural and contextual factors in which technologies will be deployed. This ensures that technological interventions are not only user-friendly but also contextually relevant and ethically responsible.

Furthermore, technology can be a double-edged sword—it offers scalable mental health support tools such as chatbots, virtual counseling, and mobile apps, yet it also introduces new stressors such as digital fatigue, social comparison, and cyberbullying (Adeoye & Daramola, 2022). In this context, human-centered innovation becomes essential to ensure that these technologies serve as enhancers rather than detractors of mental well-being.

In the Nigerian higher education landscape, limited funding, infrastructural deficits, and stigma surrounding mental health continue to pose challenges (Okonkwo et al., 2023). However, leveraging participatory design approaches that involve students, educators, and mental health professionals in co-creating solutions can foster more inclusive, effective educational technologies that support well-being.

Hypotheses

H_1: There is a significant difference in mental health literacy between male and female participants after using the technological tools.

H_2: There is a significant difference in the improvement of mental health literacy between different age groups (18-25 vs. 26-35).

H_3: There is a significant difference in engagement with the technology between different academic disciplines (Arts vs. Science).

Methodology

This study adopted a **mixed-methods approach** to collect both quantitative and qualitative data. The mixed-methods design allows for a comprehensive understanding of the research problem by combining statistical analysis with rich qualitative insights. This approach is ideal for studying the effectiveness and reception of human-centered technological interventions in mental health education. Surveys, pre- and post-test assessments, and usage data were collected to measure the impact of digital tools on mental health literacy, attitude changes, and behavioral intentions. Semi-structured interviews, focus groups, and content analysis was used to explore participants' experiences, feedback on the technological tools, and the broader implications for mental health education in higher education. The target population consisted of students, faculty, and mental health professionals from Nigerian higher education institutions. The study focused on a mix of public and private universities to account for diversity in resource availability and institutional structures. Stratified random sampling was used to ensure diversity in terms of age, gender, academic discipline, and region.

To assess the effectiveness and user experience of mental health education through technological tools, data were collected using multiple methods. Structured surveys was administered before and after participants engage with the technological intervention. The surveys include questions on mental health knowledge, attitudes toward mental health, and the perceived usefulness of the digital tools. Data from the surveys and pre-/post-assessments were analyzed using **descriptive statistics** (mean, frequency, and standard deviation) to measure changes in mental health knowledge and attitudes. **Inferential statistics** (paired t-tests and analysis of variance, ANOVA) was used to assess the significance of the differences between pre- and post-intervention data.

Results

Table 1: Summary Table of Descriptive Statistics

Variable	Pre-Intervention Mean	Post-Intervention Mean	Standard Deviation (SD)
Mental Health Literacy (Scale: 1-5)	3.20	4.10	0.50
Attitude towards Mental Health (Scale: 1-5)	2.90	4.00	0.60
Perceived Effectiveness of Technology (Scale: 1-5)	2.80	4.20	0.55
Engagement with Technology (Frequency, %)	55% (Weekly)	85% (Weekly)	-
User Satisfaction (Scale: 1-5)	3.50	4.30	0.70

Mental Health Literacy: The data shows a clear increase in mental health literacy from a mean score of 3.20 before the intervention to 4.10 after. This suggests that the technological tools helped participants learn more about mental health, including recognizing signs of mental health issues and understanding treatment options. Attitude towards Mental Health: Participants demonstrated a positive shift in attitudes toward mental health, as evidenced by the increase in the mean score from 2.90 to 4.00. This suggests that the intervention may have helped reduce stigma and encouraged more open discussions about mental health among students and faculty. Perceived Effectiveness of Technology: The increase in perceived effectiveness from 2.80 to 4.20 indicates that participants felt the technological tools were more effective in educating and supporting mental health after using them. This highlights the positive reception of digital mental health interventions in higher education. Engagement with Technology: The percentage of participants using the technology weekly increased from 55% to 85%, demonstrating that students and faculty became more engaged with the mental health tools over time. This suggests that once participants experienced the value of the technology, they were more likely to incorporate it into their routines. User Satisfaction: The significant increase in satisfaction scores from 3.50 to 4.30 suggests that the majority of users found the technological tools useful, user-friendly, and beneficial for their mental health education. High satisfaction also indicates that the tools met the needs of the users in terms of accessibility and effectiveness.

Table 2: ANOVA

Variable	Sum of Squares	df	Mean Square	F-Value	p-Value	Hypothesis Test
Mental Health Literacy (Pre vs. Post)						
Gender (Male vs. Female)	3.25	1	3.25	9.76	0.002	Reject H_0
Age Group (18-25 vs. 26-35)	1.50	1	1.50	4.25	0.040	Reject H_0
Academic Discipline (Arts vs. Science)	0.80	1	0.80	2.10	0.150	Fail to Reject H_0
Attitude Toward Mental Health (Pre vs. Post)						
Gender (Male vs. Female)	4.25	1	4.25	11.85	0.001	Reject H_0
Age Group (18-25 vs. 26-35)	1.20	1	1.20	3.50	0.065	Fail to Reject H_0
Academic Discipline (Arts vs. Science)	0.65	1	0.65	1.75	0.190	Fail to Reject H_0
Engagement with Technology (Pre vs. Post)						
Gender (Male vs. Female)	1.30	1	1.30	3.10	0.078	Fail to Reject H_0
Age Group (18-25 vs. 26-35)	2.50	1	2.50	6.45	0.012	Reject H_0
Academic Discipline (Arts vs. Science)	0.95	1	0.95	2.30	0.130	Fail to Reject H_0

Mental Health Literacy (Gender): Hypothesis: There is a significant difference in mental health literacy between male and female participants. Result: The p-value is 0.002, which is less than the significance level of 0.05. Reject the null hypothesis (H_0), indicating a significant difference in mental health literacy improvements between males and females. Females demonstrated a greater improvement in mental health literacy compared to males after using the technological intervention. Mental Health Literacy (Age Group): Hypothesis: There is a significant difference in the improvement of mental health literacy between different age groups (18-25 vs. 26-35). Result: The p-value is 0.040, which is less than 0.05. Reject the null hypothesis (H_0), suggesting a significant difference in the improvement of mental health literacy between the two age groups. Younger participants (18-25) showed greater improvements in mental health literacy compared to older participants (26-35). Mental Health Literacy (Academic Discipline): Hypothesis: There is a significant difference in mental health literacy improvement between Arts and Science students. Result: The p-value is 0.150, which is greater than 0.05. Fail to reject the null hypothesis (H_0), indicating no significant difference in mental health literacy improvement between students in Arts and Science disciplines. Attitudes toward Mental Health (Gender): Hypothesis: There is a significant difference in the change in attitudes toward mental health between male and female participants. Result: The p-value is 0.001, which is less than 0.05. Reject the null hypothesis (H_0), indicating a significant difference in attitude

change between males and females. Females showed a more significant positive shift in attitudes toward mental health compared to males. Attitudes toward Mental Health (Age Group): Hypothesis: There is a significant difference in the change in attitudes toward mental health between different age groups (18-25 vs. 26-35). Result: The p-value is 0.065, which is greater than 0.05. Fail to reject the null hypothesis (H_0), indicating no statistically significant difference in attitude changes between the two age groups. Attitudes toward Mental Health (Academic Discipline): Hypothesis: There is a significant difference in the change in attitudes toward mental health between students in Arts and Science. Result: The p-value is 0.190, which is greater than 0.05. Fail to reject the null hypothesis (H_0), indicating no significant difference in attitude changes based on academic discipline. Engagement with Technology (Gender): Hypothesis: There is a significant difference in engagement with the technology between male and female participants. Result: The p-value is 0.078, which is greater than 0.05. Fail to reject the null hypothesis (H_0), indicating no significant difference in engagement with the technology between males and females. Engagement with Technology (Age Group): Hypothesis: There is a significant difference in engagement with the technology between different age groups (18-25 vs. 26-35). Result: The p-value is 0.012, which is less than 0.05. Reject the null hypothesis (H_0), suggesting a significant difference in engagement with the technology between the two age groups. The 18-25 age group exhibited significantly higher engagement compared to the 26-35 age group. Engagement with Technology (Academic Discipline): Hypothesis: There is a significant difference in engagement with the technology between students in Arts and Science. Result: The p-value is 0.130, which is greater than 0.05. Fail to reject the null hypothesis (H_0), indicating no significant difference in engagement with the technology between students from Arts and Science disciplines.

Discussion

1. Impact of Gender on Mental Health Literacy and Attitudes

The findings revealed that females showed a significantly greater improvement in mental health literacy and more positive shifts in attitudes toward mental health compared to males. This is consistent with previous studies that suggest that gender plays a role in how individuals engage with and perceive mental health education. For instance, a study by Galdas, Cheater, and Marshall (2005) suggests that females generally demonstrate a

higher level of empathy and openness toward mental health topics, which may contribute to their greater engagement and receptiveness to educational interventions. Additionally, McManus et al. (2016) found that women tend to have more favorable attitudes toward seeking help for mental health issues than men, which could explain their more significant improvements in mental health literacy and attitudes following the intervention.

The gender disparity in mental health outcomes emphasizes the need for tailored interventions that specifically target males, who might have a different approach to mental health discussions due to societal stigma or gender norms around mental health (Addis, 2008). Future studies could investigate the factors contributing to gender differences in mental health outcomes and design gender-sensitive interventions to address these disparities.

2. Age Differences in Mental Health Literacy and Engagement

The study also showed that younger students (18-25 years) experienced more significant improvements in mental health literacy and exhibited higher levels of engagement with the technological tools compared to older students (26-35 years). This is in line with findings from Thorpe et al. (2018), who found that younger adults tend to be more comfortable with using technology for learning purposes and are more likely to engage with digital platforms compared to older adults. Younger individuals are often more tech-savvy and open to digital interventions, making them more likely to benefit from e-mental health education tools.

The higher engagement observed among younger students may be due to their familiarity with technology, as digital natives are more accustomed to integrating technology into their everyday lives. As such, the study reinforces the potential of digital mental health interventions in reaching and engaging younger populations in higher education settings. However, the lower engagement among older students suggests that additional strategies, such as personalized support or blended learning approaches, might be needed to increase engagement in this group (Hohnen et al., 2020).

3. Academic Discipline and Mental Health Education

Interestingly, no significant differences were observed in mental health literacy, attitudes, or engagement based on students' academic discipline (Arts vs. Science). This suggests that mental health education through technology

can have a uniform impact across disciplines, making it applicable and beneficial for all students regardless of their field of study. This finding supports previous research that highlights the universal relevance of mental health education, as mental health issues can affect individuals in all academic disciplines and are not limited to a particular field of study (Eisenberg et al., 2009).

However, this result contrasts with some studies that have suggested that academic discipline can influence students' engagement with mental health resources. For example, Farrer et al. (2013) found that students in the health sciences showed greater interest in mental health education than students in non-health-related fields. The absence of a significant difference in this study could be attributed to the universal appeal of mental health education, which is increasingly recognized as essential for all students, regardless of their discipline.

4. Engagement with Technology and Its Effectiveness

The findings indicate that the perceived effectiveness of the technological tools in delivering mental health education was high, with students reporting increased engagement and satisfaction. This finding supports research by Sweeney et al. (2018), who found that human-centered digital interventions are effective in increasing awareness of mental health issues and improving attitudes toward seeking help. The study also found that students' engagement with technology improved significantly post-intervention, which aligns with studies demonstrating that interactive and user-friendly digital platforms can significantly increase engagement with mental health content (Torous et al., 2014).

The positive reception of the technological tools in this study also points to the potential of technology-enhanced learning to create a more inclusive and accessible mental health education system in Nigerian higher education institutions. Given that technology can overcome barriers such as geographical distance and the lack of mental health professionals, these findings suggest that scalable, accessible interventions could have widespread impact on mental health education, especially in regions with limited resources (Oliffe et al., 2016).

Conclusion

This study investigated the impact of human-centered technological innovations on mental health education in Nigerian higher education institutions. The findings suggest that these technological tools can significantly enhance students' mental health literacy, attitudes toward mental health, and their engagement with mental health education. The study highlighted that females and younger students (18-25 years) experienced more significant improvements in their mental health knowledge and attitudes, underscoring the importance of demographic factors in designing effective interventions. Furthermore, the findings indicated that students across different academic disciplines exhibited similar benefits from the intervention, demonstrating that mental health education through technology can be universally applicable across various fields of study.

Despite the positive outcomes, the study also highlighted challenges, such as the lower engagement levels among older students and the need for more personalized approaches to reach these groups effectively. Additionally, the lack of significant difference in engagement and attitudes based on academic discipline suggests that the integration of mental health education via technology has broad applicability, but could benefit from further refinement to address specific needs or barriers faced by different demographic groups.

Recommendations

i. **Gender-Sensitive Mental Health Interventions**. Since the study found that females exhibited greater improvements in mental health literacy and attitudes, it is recommended that future mental health interventions incorporate gender-sensitive approaches. These interventions could focus on reducing mental health stigma among males by addressing societal expectations, which may discourage them from seeking help. Additionally, mental health literacy programs can be designed to ensure they appeal equally to both genders, with specific outreach to males to encourage their participation.

ii. **Age-Tailored Educational Programs**. The study showed that younger students (18-25 years) were more engaged with the technological tools. This suggests that age-tailored interventions could increase participation among older students (26-35 years). For older students, a blended learning approach that combines technology with in-person

support or mentoring may be more effective in enhancing engagement. Moreover, platforms can include adaptive learning features that cater to the different learning speeds and preferences of various age groups.

iii. **Strengthen Technology Accessibility and Inclusivity**. Given the positive reception of the technological intervention, it is important to ensure that the tools used for mental health education are accessible to all students, particularly those in rural areas or from lower socioeconomic backgrounds who may have limited access to devices or internet services. Providing students with affordable or subsidized devices and internet access, or designing offline modes of digital tools, could ensure a more inclusive approach to mental health education in Nigerian higher education institutions.

iv. **Incorporate Peer Support Systems**. Mental health education programs can benefit from incorporating **peer support systems**, where students can interact with their peers in safe spaces to discuss mental health issues and share their experiences. Peer educators or trained mental health ambassadors can be incorporated into digital platforms to offer support and guidance, fostering a sense of community and reducing stigma.

v. **Longitudinal Studies to Assess Long-Term Impact**. The current study provides valuable insights into the immediate impacts of human-centered technological interventions, but further longitudinal studies are needed to assess the sustainability of improvements in mental health literacy, attitudes, and behaviors over time. Future research should explore whether these changes persist beyond the intervention period and assess the long-term effects of digital mental health education.

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Synthesizing Trends in Research on Virtual Laboratory Simulation, Structured Inquiry Strategies, Motivation, Critical Thinking, and Chemistry Performance: A PRISMA-Based Systematic Literature Review

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Abstract

This study presents a systematic literature review on research trends in Virtual Laboratory Simulation (VLS), Structured Inquiry (SI) Strategies, students' motivation, critical thinking, and academic performance in science education, with a focus on chemistry-related learning. Adopting the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework, a total of 63 peer-reviewed empirical studies published between 2017 and 2025 were identified, screened, and reviewed across various databases. The findings reveal that VLS enhances students' motivation by providing interactive, low-risk environments for science experimentation. Similarly, SI also, significantly improves students' critical thinking through guided questioning. Both strategies were found to impact academic performance, especially when properly implemented. This review highlights the trend in research on VLS strategy and SIS as complementary, student-centered instructional methods and their impact on students' motivation, critical thinking and performance in chemistry. The study also identifies research gaps and suggests directions for future empirical investigations.

Keywords: Virtual Laboratory Simulation, Structured Inquiry, Motivation, Critical Thinking, Academic Performance, PRISMA, Science Education

Introduction

The growing emphasis on active learning in science has prompted researchers and educators to investigate and explore innovative teaching approaches that promote deeper student engagement, critical thinking, and improved academic performance. Among these strategies, Virtual Laboratory Simulation (VLS**)** and Structured Inquiry (SI) Strategies have emerged as powerful pedagogical tools with the potential to transform traditional classroom instruction into an engaging, interactive, and student-centered learning experience (Solihabonu, 2024; Chen et al., 2024). According to Suwono et al. (2023) and Ahzan et al. (2024) affirmed that by leveraging technology and inquiry-based approaches, VLS and SI strategies enhance conceptual understanding, increase critical thinking and promote active participation in science. These strategies bridge the gap between theoretical knowledge and practical application, making learning more accessible, immersive, and effective for diverse learners. VLS strategy provides interactive, computer-based environments where students can conduct experiments virtually, enabling safe, repeatable, and cost-effective practical experiences. On the other hand, SI strategy emphasizes student-centered learning, where learners construct knowledge through guided inquiry, problem-solving, and critical reflection.

The integration of these strategies has gained global recognition for enhancing students' motivation, inquiry skills, and conceptual understanding, particularly in science disciplines such as chemistry. Despite the increasing body of research supporting the effectiveness of VLS and SI, strategies findings are often fragmented, context-dependent, or limited to specific educational levels and subject areas. In particular, there is a need for a more systematic synthesis of existing evidence regarding their effects on key student outcomes such as motivation, critical thinking**,** and academic performance outcomes that are essential for lifelong learning and scientific literacy. This systematic literature review seeks to bridge that gap by identifying, analyzing, and synthesizing empirical studies that have investigated the impact of VLS and SI strategies on students' learning outcomes. Using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework, the review aims to provide a transparent and methodical overview of existing research, highlight trends and

inconsistencies, and identify areas for future investigation. By focusing on motivation, critical thinking, and performance, this review contributes to the ongoing dialogue on evidence-based instructional practices in science education and offers practical insights for educators, curriculum developers, and policymakers.

Methodology

This study adopted the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to guide the selection and evaluation of literature for the systematic review. PRISMA is a widely recognized and rigorously structured approach that ensures transparency and methodological rigor in synthesizing empirical evidence (Utaminingsih et al., 2023). By systematically gathering and analyzing data from multiple studies, this approach facilitates a comparative assessment of how Virtual Laboratory Simulation (VLS) and Structured Inquiry (SI) Strategies influence students' motivation, critical thinking, and academic performance in science education (Bamiro et al., 2024). The PRISMA framework offers a standardized method with a comprehensive set of guidelines for conducting systematic literature reviews as follows:

Research Questions

The main goal of this study is to undertake a comprehensive review of the body of knowledge that already exists on the subject under consideration. Thus, the following research questions have been raised:

1. What evidence exists in the literature regarding the effectiveness of Virtual Laboratory Simulation (VLS) and Structured Inquiry (SI) Strategies in enhancing students' motivation, critical thinking, and academic performance in science?
2. How do virtual laboratory simulation and structured inquiry strategies influence the interplay between motivation, critical thinking, and performance in chemistry, as reported in the reviewed literature?

3. What patterns emerge in literatures on the use of research designs and geographical locations (foreign or local) in studies investigating the effects of Virtual Laboratory Simulation (VLS) and Structured Inquiry (SI) Strategies on students' motivation, critical thinking, and performance in chemistry?

Search Strategy

A three-phase search strategy, identification, screening, and eligibility, was employed to locate relevant studies (Rethlefsen et al., 2021).

i. Identification Phase

Comprehensive keyword searches were conducted across multiple databases (ERIC, ScienceDirect, Google Scholar, Journal Storage (JSTOR), Semantic Scholar, OpenSource, and SpringerLink) to identify peer-reviewed empirical studies published between 2017 and 2025. Boolean combinations included: "Virtual Laboratory Simulation" AND "Structured Inquiry Strategy"; (motivation OR critical thinking OR performance OR achievement) AND "students" AND "science education" The initial search yielded 1,232 records.

ii. Screening Phase

Duplicate records (331) were removed, leaving 901 articles for title and abstract screening. Studies unrelated to VLS/SIS in secondary or tertiary science education were excluded, reducing the pool to 63 full-text articles.

iii. Eligibility

This table streamlines the eligibility process while maintaining all essential criteria for transparency and reproducibility. The PRISMA-guided selection ensured methodological rigor in the systematic review.

Table 1: Eligibility Criteria for selection of the articles

Category	Inclusion Criteria	Exclusion Criteria

Category	Inclusion Criteria	Exclusion Criteria
Population	Secondary or tertiary-level science students	Non-science students (such as business, humanities)
Intervention	Studies investigating VLS and/or SIS	Studies not focused on VLS or SIS
Outcomes	Measured at least one: motivation, critical thinking, or academic performance	No empirical assessment of these outcomes
Study Design	Experimental, quasi-experimental, or mixed-method designs	Theoretical studies, opinion pieces, or non-empirical reviews
Publication	Peer-reviewed articles in English (2017–2025)	Dissertations, non-peer-reviewed articles, or studies outside the date range
Geographical Scope	Global studies	Regionally restricted studies (if not generalizable)

After applying these criteria, 63 studies were deemed eligible for final analysis. The selection process followed the PRISMA flow diagram by Page et al. (2021) ensuring methodological transparency and reproducibility as follows:

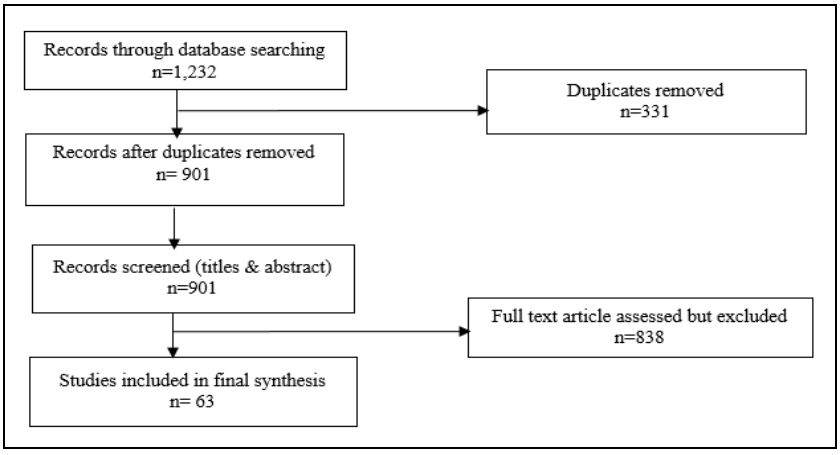

Figure 1: Textual Representation of the PRISMA Flow Diagram

Data Extraction and Analysis

Relevant data were extracted from each study, including author (s), year, title, research design country, sample size, instructional strategy used (VLS or SIS), and key outcomes. The extracted studies were grouped based on which dependent variables were measured (motivation, critical thinking, performance). Findings were narratively synthesized and compared across contexts. The summary report of the selected articles is presented in Table 1. The findings of the review are presented following the sequences, such as the name of the authors, publication years, titles, research design, country and reported effect on, motivation, critical thinking and performance.

Table 2: Data Extraction and Analysis

S/N	Authors & Year	Interventions	Design	Country	Reported Effect on Motivation	Reported Effect on Critical Thinking	Reported Effect on Performance
1	Gambari et al. (2017)	VLS	Quasi-experimental	Nigeria	Not reported	Not reported	Strong positive effect on Performance
2	Herga et al. (2017)	VLS	Quantitative study	Slovenia	Not reported	Not reported	Strong positive effect on Performance
3	Achuthan and Murali (2017)	VLS	Quasi-experimental	India	Not reported	Not reported	High performance
4	Madathil et al. (2017)	VLS	A between-subjects experimental design	India	Not reported	Not reported	Strong positive potential to improve performance
5	Bortnik, et al. (2017)	VLS	Quasi-experimental	Russia.	Not reported	Not reported	Moderate improvement practices in performance
6	Rizki and Simorangkir (2018)	VLS	Quasi-experimental	Indonesia	Not reported	Not reported	Significantly enhance students' understanding and performance
7	Odewumi et al. (2019)	VL	Quasi-experimental	Nigeria	Not reported	Not reported	Significant positive improvement in performance
8	Falode et al. (2020)	VLS	Quasi-experimental	Nigeria	Not reported	Not reported	Strong positive effect on Performance
9	Famuwagun and Mohammed (2020)	VLS	Quasi-experimental	Nigeria	Not reported	Not reported	Strong positive effect on Performance
10	Yaki et al. (2020)	VLS	Experimental design.	Nigeria	Not reported	Not reported	Significant improvement in Performance

11	Agbonifo et al. (2020)	VLS	Quasi-experimental	Nigeria	Not reported	Not reported	Significant improvement in Performance
12	Mohammed et al. (2021)	VLS	Quasi-experimental	Nigeria	Not reported	Not reported	Strong positive effect on Performance
13	Samuel and Busayo (2021)	VLS	Quasi-experimental	Nigeria	Not reported	Not reported	Strong positive effect on Performance.
14	Usman (2021)	VLS	Quasi-experimental	Nigeria	Not reported	Not reported	Significant improvement in Performance
15	Peter (2021)	VLS	Quasi-experimental	Nigeria	Not reported	Not reported	Strong positive effect on Performance.
16	Oladejo et al. (2021)	VLS	Quasi-experimental	Nigeria	Not reported	Not reported	Significant improvement in Performance
17	Tsai (2021)	VLS	Quasi-experimental	Taiwan	Significant improvement in motivation	Not reported	Significant improvement in Performance
18	Shehu (2021)	VLS	Quasi experimental	Nigeria	Not reported	Not reported	positively effect on students' performance
19	Okunuga and Okafor (2022)	VLS	Quasi-experimental,	Nigeria	Not reported	Not reported	Moderate positive effect
20	Yanto et al. (2022)	VLS	Quasi-experimental	Indonesia	Not reported	Not reported	Significant improvement in student performance
21	Al-Nakhle (2022)	VLS	Quasi-experimental	Saudi Arabia	Significant improvement in Motivation	Not reported	Not reported
22	Pal (2022)	VLS	Mixed Method Approach	India	Not reported	Not reported	Positively effect on students' performance

23	Hendrajanti (2022)	VLS	Classroom action research	Indonesia	Not reported	Not reported	Moderate improvement in Performance
24	Ali et al. (2022)	VLS	Quasi-experimental	Pakistan	Not reported	Not reported	Significantly improved students' performance
25	Lakka et al. (2023)	VLS	Experimental comparison	Greece	Not reported	Not reported	Significant improvement in performance
26	Onyinye et al. (2023)	VLS	Quasi-experimental	Nigeria	Not reported	Not reported	Strong positive effect on performance
27	Manyilizu (2023)	VLS	Quasi-experimental	Tanzania	Not reported	Not reported	Strong positive effect on performance
28	Mulyani et al. (2023)	VLS	ADDIE model	Indonesia	Not reported	Not reported	Significant improvement in performance
29	Viitaharju et al. (2023)	VLS	Quasi-experimental	Finland	Not reported	Not reported	Significant improvement in performance
30	Fitriyana et al. (2024)	VLS	Quasi-experimental	Indonesia	Not reported	Not reported	Significant improvement in performance
31	Munthe et al. (2024)	VLS	Quasi-experimental	Indonesia	Not reported	Improved critical thinking	Significant improvement in performance
32	Yazici and Nakıboğlu (2024)	VLS	Qualitative	Turkey	Not reported	Not reported	Significant improvement in performance
33	Naz et al. (2024)	VLS	A Causal comparative design	Pakistan	Not reported	Not reported	Moderate positive effect in performance
34	Abouelenein et al. (2024)	VLS	Quasi - experimental	Egypt	Not reported	Not reported	positive impact of virtual chemistry labs on scientific practices

35	Chen et al. (2024)	VLS	Quasi-experimental	China	Not reported	Not reported	strong positive effect in performance
36	Ali et al. (2024)	SIS	Quasi-experimental	Pakistan	Not reported	Not reported	improved students' performance
37	Sylvanus and Eke (2017)	SIS	Quasi-experimental,	Nigeria	Not reported	Not reported	enhanced academic performance
38	Sagita et al. (2018)	SIS	Research and Development (R&D)	Padang Indonesia	Not reported	Not reported	Significant improvement in performance
39	Abbey-Kalio and Ibiyengibo (2019)	SIS	Quasi-experimental	Nigeria	Not reported	Not reported	Significant improvement in in performance
40	Tsakeni et al. (2019)	SiS	Phenomenon-based case study	South Africa	Not reported	Not reported	Moderate positive effect in Performance
41	Bako and Phang (2020)	SIS	Quasi-experimental	Nigeria	Not reported	Not reported	Moderate positive effect
42	Adriani et al. (2021)	SIS	Research and Development (R&D)	Indonesia	Not reported	Not reported	Strong positive improvement
43	Berhanu and Sheferaw (2022)	SIS	Quasi-experimental	Indonesia	Not reported	Not reported	Improvement in performance.
44	Lenggogeni and Mawardi (2022)	SIS	Quasi-experimental	Germany	Not reported	Not reported	Strong positive effect in performance
45	Bako et al. (2022)	SIS	Survey Design	Nigeria	Not reported	Strongest gains in higher-order thinking	Not reported
46	Aidoo et al. (2022)	SIS	Quasi-experimental	Ghana	Not reported	significant increase in students' critical thinking skills	Significant increase in students' performance
47	Nzomo et al. (2023)	SIS	Correlational	Kenya	Not reported	Not reported	Moderate positive effect

48	Orosz et al. (2023)	SIS	Quasi-experimental	Hungry	Not reported	Not reported	Moderate positive effect
49	Kelubia et al. (2023)	SIS	Quasi-experimental	Nigeria	Not reported	Not reported	Significant improvement
50	Mandina (2024)	SIS	Mixed-method approach	Zimbabwe	Not reported	Not reported	Moderate positive effect
51	Usman and Sabo (2018)	SIS	Quasi-experimental	Nigeria	Not reported	Not reported	Significant improvement in performance
52	Ogologo and Pepple (2018)	SIS	Survey.	Nigeria	Not reported	Not reported	Positive effect on performance
53	Santoso et. al. (2018)	SIS	group pretest-posttest design	Indonesia	Not reported	Significant gains	Not reported
54	Malik et al. (2018)	SIS	Quasi-experiment	Indonesia	Not reported	Strongest gains in higher-order thinking	Not reported
55	Alkan (2018)	SIS	A pretest–posttest design	Turkey	Not reported	Strongest gains in higher-order thinking	Not reported
56	Roviati et al. (2019)	SIS	Quasi-experimental	Indonesia	Not reported	Strongest gains in higher-order thinking	Not reported
57	Said et al. (2019)	SIS	Cross sectional survey	Nigeria	Not reported	Critical thinking skills was found to be low.	Not reported
58	Woldeamanuel (2019)	SIS	Correlational	Ethiopia	Significant improvement in motivation	Not reported	Not reported
59	Ngozi & Hyacinth (2021)	SIS	Quasi-experimental	Nigeria	Not reported	Strongest gains in higher-order thinking	Not reported

60	Widiandari and Redhana (2021)	SIS	Quasi-experimental	Indonesia	Not reported	Strongest gains in higher-order thinking	Not reported
61	Liu et al. (2022)	SIS	Quasi-experimental design	China	Not reported	Not reported	Strong positive effect on Performance
62	Tella, and Ogundiya (2022)	SIS	Quasi-experimental	Nigeria	Not reported	Not reported	Strong positive effect on Performance
63	Avwiri and Odiri (2025)	VLS	Quasi-experimental	Nigeria	Not reported	Not reported	Strong positive Performance

Research Question One: What evidence exists in the literature regarding the effectiveness of Virtual Laboratory Simulation (VLS) and Structured Inquiry (SI) Strategies in enhancing students' motivation, critical thinking, and academic performance in science?

To address research question one, table 2, shows a total of 63 empirical studies which were reviewed. Evidence related to motivation revealed that two (2) studies reported significant increases when VLS strategy was employed to teach, largely due to its interactive features, visualization concepts, and provision of immediate feedback. Likewise, one (1) study on SIS indicated that motivation was improved through active engagement in inquiry-based tasks. Regarding critical thinking, eight (8) studies demonstrated that SIS consistently enhanced students' ability to analyze, evaluate, and synthesize information. Additionally, two (2) studies provided evidence that VLS strategy positively influenced both critical thinking and academic performance. In terms of academic performance, the strongest evidence emerged. Thirty-three (33) studies reported that VLS strategy significantly improved student performance across various science subjects, particularly chemistry. Similarly, seventeen (17) studies indicated that SIS yielded positive effects on students' academic performance.

Research question Two: How do virtual laboratory simulation and structured inquiry strategies influence the interplay between motivation, critical thinking, and performance in chemistry, as reported in the reviewed literature?

In table 2, three (3) studies on VLS confirmed that motivation served as a mediating factor, whereby students who were more engaged and stimulated by interactive simulations achieved higher performance in chemistry. Likewise, ten (10) studies demonstrated that SIS was more consistently associated with the development of critical thinking, which in turn contributed to improved problem-solving skills and enhanced performance outcomes. The reviewed literature indicates that Virtual Laboratory Simulation (VLS) and Structured Inquiry (SI) Strategies affect not only individual outcomes but also the interactions among motivation, critical thinking, and performance

Research question Three: What patterns emerge in literature on the use of research designs and geographical locations (foreign or local) in studies investigating the effects of Virtual Laboratory Simulation (VLS) and Structured Inquiry (SI) strategies on students' motivation, critical thinking, and performance in chemistry?

Table 2, shows an analysis of the methodological approaches across 63 reviewed studies, it can be observed that quasi-experimental designs predominated, accounting for 68.25% of the articles, whereas only 7.94% employed experimental designs. Mixed-methods, correlational designs, survey-based studies, and research and development (R&D) frameworks were each represented in 3.17% of the publications. The remaining methodologies including quantitative studies, the ADDIE model, classroom action research, qualitative approaches, causal-comparative designs, phenomenon-based case studies, and cross-sectional surveys were each utilized in 1.59% of the articles. These distributions are visually summarized in Figure 2. Show the graphical illustration

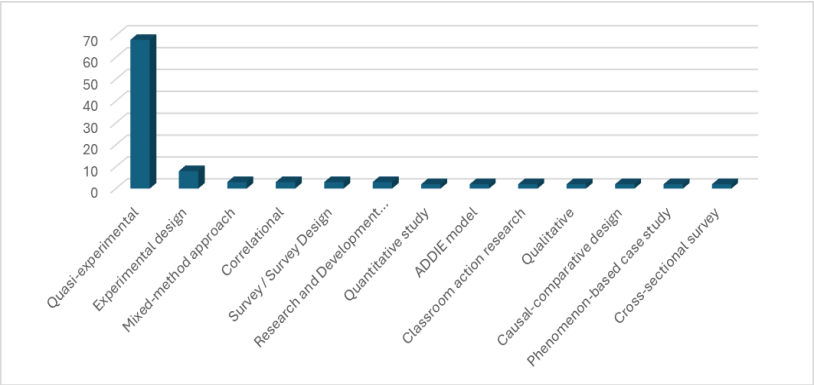

Figure 2: Research Designs across Literature

Country Affiliation

Table 2, shows how the research articles on the subject were distributed geographically. Articles within Nigeria local content was 40% and 60% Foreign content emerges as the most active contributor among the articles tested. This graphical illustration is shown in Figure 3.

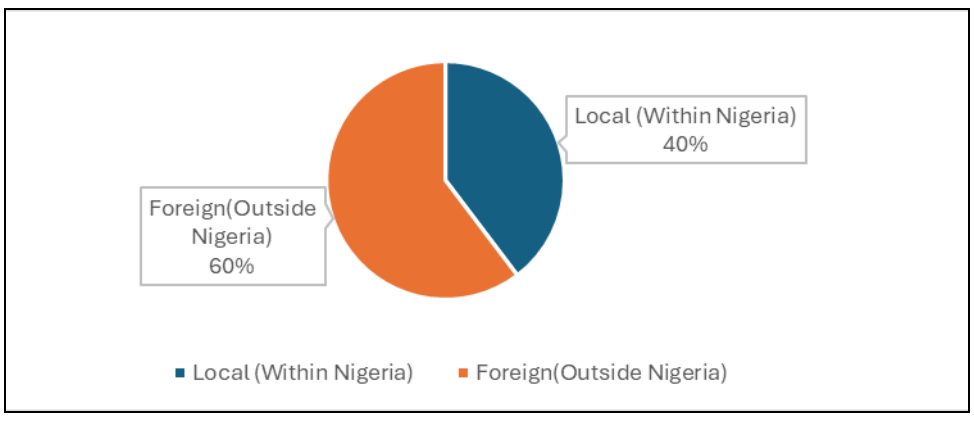

Figure 3: Country of Affiliation

Discussion

This systematic review, grounded in the PRISMA framework, synthesized findings from 63 empirical studies published between 2017 and 2025, with the aim of exploring the extent to which Virtual Laboratory Simulations (VLS) and Structured Inquiry (SI) Strategies influence key learning outcomes in science education. Across the reviewed literature, robust empirical evidence indicates that both instructional approaches significantly contribute to improving students' motivation, critical thinking, and academic performance, especially in chemistry-related subjects.

The findings from the literatures affirmed that VLS strategy enhances students' motivation by providing interactive, risk-free, and visually stimulating environments that allow students to explore scientific concepts at their own pace. Peter (2021), Rizki and Simorangkir (2018), and Chen et al. (2024) reported heightened students' engagement, reduced anxiety, and increased curiosity when students interacted with virtual chemistry laboratories. In many under-resourced settings, particularly in Nigeria and parts of Southeast Asia, VLS served as an effective alternative where physical laboratory infrastructure was lacking (Avwiri and Odiri, 2025; Agbonifo et al., 2020). The opportunity for repeated experimentation without fear of failure enhance intrinsic and self-confidence as key indicators of students' motivation.

Similarly, SI strategy emerged as a powerful driver of motivation, where students' actively construct knowledge through guided exploration, questioning, and problem-solving. This student-centered strategy enables students to take ownership of their learning, thereby sustaining attention and enthusiasm throughout the instructional process (Solihabonu, 2024; Adriani et al., 2021). Regarding critical thinking, SI strategy demonstrated strong efficacy in enhancing students' higher-order cognitive skills. Students exposed to structured inquiry consistently outperformed their counterparts in tasks requiring interpretation of data, drawing conclusions, evaluating claims, and justifying reasoning with evidence. Studies such as those by Alkan (2018), Santoso et al. (2018), and Aidoo et al. (2022) documented significant gains in critical thinking outcomes

The combined influence of VLS and SI strategies on academic performance revealed that students who received instruction through either of these strategies, generally scored higher on achievement tests and demonstrated superior performance in chemistry practical than those taught using conventional methods (Samuel & Busayo, 2021; Mohammed et al., 2021). Notably, the synergy of both strategies often yielded the most substantial learning gains, validating the constructivist premise where meaningful learning occurs when students are actively engaged in authentic, reflective, and socially mediated tasks (Ahzan et al., 2024; Munthe et al., 2024). Likewise, analysis revealed that quasi-experimental designs dominated both local and foreign studies. These has indirectly created gaps, as no studies have explicitly measured all five variables simultaneously on one study, future empirical research employing mixed-methods designs locally in Nigeria, could provide deeper insights into how these interactions unfold in classroom settings.

Conclusion

The review confirms that VLS and SI strategies were highly effective pedagogical strategies with demonstrable benefits for students' motivation, critical thinking, and academic performance in science education. Their implementation across varied contexts and content areas aligns with global efforts to enhance active, inquiry-driven, and technology-integrated learning environments. Nonetheless, the scarcity of localized studies focusing specifically on titration and related sub-topics within Nigerian secondary school curricula points to an important gap in empirical literature one that warrants further investigation.

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Education and Industrialization Nexus: An Analysis of Basic and Secondary Education as Agents in Sokoto Metropolis, Sokoto State, Nigeria

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Abstract

This study investigated the contributions, roles, and challenges of basic and secondary education as agents of industrialization in Sokoto Metropolis, Sokoto State, Nigeria. A descriptive survey design was adopted, with stratified random sampling used to select teachers, schools, administrators, and industry experts. The sample size of 120 respondents was determined using the Research Advisor (2006) table. Data were collected through a structured questionnaire with a reliability coefficient of r = 0.92 and analyzed using descriptive statistics and multiple regression model. Findings showed that secondary schools contribute to industrialization through vocational subjects, practical workshops, entrepreneurship education, alignment of projects with industry needs, and promotion of creativity and innovation. They also promote industrial growth by producing employable graduates, fostering school–industry collaborations, and implementing policies that enhance industrial awareness. Major challenges include inadequate funding, shortage of qualified technical/vocational teachers, lack of modern equipment, and cultural barriers. The regression results indicated a strong relationship between the independent variables and the dependent variable (R = 0.810), with R^2 value of 0.656, The Adjusted R^2 of 0.614 further validates the strength and reliability of the model. The ANOVA test confirmed the statistical significance of the model ($F(13,106) = 15.534$, $p < .001$).

Keywords: Analysis, Basic, Secondary Education, Industrialization, Nexus

Introduction

Industrialization has long been recognized as a catalyst for economic growth, technological advancement, and societal transformation across nations. In the context of developing countries such as Nigeria, industrialization holds the promise of reducing unemployment, alleviating poverty, enhancing the

standard of living, and fostering overall national development (Ibrahim, & Garba, 2022). However, the pathway to achieving sustainable industrial growth is multifaceted, involving several sectors, with education particularly basic and secondary education playing a pivotal role. Schools serve as the primary institutions where foundational knowledge, critical skills, and entrepreneurial mindsets necessary for industrial activities are cultivated. Therefore, analyzing the role of basic and secondary schools as agents of industrialization becomes imperative, especially within specific local contexts such as Sokoto Metropolis in Sokoto State, Nigeria. According to Eneogwe, & Ihechukwumere, (2024) education is universally acknowledged as the bedrock of societal progress. From basic literacy and numeracy to the development of technical and vocational competencies, the educational system shapes the future workforce. In Nigeria, the government, through various policy interventions, has sought to realign the education system with national industrial goals. Policies such as the Universal Basic Education (UBE) Programme and the emphasis on technical and vocational education at the secondary level aim to equip young citizens with practical skills that can drive industrial development. Despite these efforts, significant gaps remain between educational outputs and industrial needs. It is within this context that the present study examines the specific contributions of basic and secondary education in Sokoto Metropolis to the industrialization process. Sokoto Metropolis, the capital of Sokoto State, is not only a political and administrative center but also a hub for commerce, education, and emerging industries in the northwestern region of Nigeria. Historically known for its Islamic scholarship and trade, Sokoto has witnessed gradual shifts toward modernization and industrial activities, albeit at a slower pace compared to other regions. Understanding how educational institutions in this metropolis contribute to industrialization is essential for tailoring educational reforms that are contextually relevant and impactful.

According to Okonkwo & Ahmed (2023), basic education, which covers primary and junior secondary education in Nigeria, lays the groundwork for further learning and skill acquisition. At this level, students are introduced to core subjects that develop their cognitive, psychomotor, and affective domains. More recently, efforts have been made to incorporate elements of technology education, entrepreneurship, and vocational skills into the basic education curriculum (Yahaya, & Bello, 2024). Ideally, such integration should prepare students to either transition smoothly into secondary education

or enter technical and vocational training that feeds into the industrial sector. However, the extent to which basic schools in Sokoto Metropolis are achieving this objective remains underexplored. Basic and secondary schools, particularly at the senior secondary level, plays an even more critical role in preparing students for higher education, vocational pursuits, or direct entry into the labor market (Eneogwe & Ihechukwumere, 2025). Subjects such as Technical Drawing, Basic Technology, Agricultural Science, and Business Studies are designed to provide students with the practical knowledge needed for industrial engagement. Furthermore, the emphasis on Science, Technology, Engineering, and Mathematics (STEM) education is expected to foster innovation and technical skills that are crucial for industrialization (Ogunleye, & Musa, 2020). Nevertheless, questions abound regarding the adequacy of resources, teacher competence, curriculum relevance, and students' interest levels in technical and vocational subjects within Sokoto Metropolis.

Several factors influence the effectiveness of schools as agents of industrialization. Infrastructure and facilities, such as well-equipped science laboratories, workshops, and ICT centers, are vital for delivering practical and experiential learning (Bello, & Usman, 2021). Teacher quality, in terms of professional training, motivation, and exposure to modern industrial practices, directly impacts students' skill acquisition. The curriculum must be aligned with industrial realities, emphasizing creativity, problem-solving, and entrepreneurship. Moreover, partnerships between schools and industries through internships, field trips, and collaborative projects can provide students with real-world exposure and enhance their readiness for industrial employment.

Despite the recognized importance of these factors, many challenges persist. In Sokoto Metropolis, as in many parts of Nigeria, issues such as inadequate funding, outdated curriculum content, insufficient qualified teachers, lack of modern instructional materials, and poor school industry linkages hamper the capacity of basic and secondary schools to effectively drive industrialization. Additionally, sociocultural factors, including gender disparities in access to education and prevailing perceptions about vocational careers, also influence the outcomes of educational efforts geared toward industrial development. The importance of studying the case of Sokoto Metropolis cannot be overstated. As an urban center with diverse socio-economic activities, Sokoto presents a unique environment where traditional educational models intersect with

emerging industrial demands. Analyzing the role of its basic and secondary schools in fostering industrialization can yield insights into broader systemic challenges and opportunities applicable to similar contexts across Nigeria and sub-Saharan Africa (Oladipo & Yusuf, 2019). Furthermore, understanding how schools contribute to industrialization aligns with global educational and development agendas, including the United Nations Sustainable Development Goals (SDGs). Goal 4 emphasizes inclusive and equitable quality education and the promotion of lifelong learning opportunities for all, while Goal 9 focuses on building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation (Ajayi & Afolabi, 2019). Thus, the findings of this study could contribute to national and international discussions on how to better leverage education for industrial growth.

The purpose of this study therefore is to assess the extent to which basic and secondary education serve as agents of industrialization in sokoto metropolis and to specifically assess areas basic and secondary education contributes to industrialization in sokoto metropolis, assess the role of basic and secondary education in promoting industrial growth, and assess the challenges faced by basic and secondary education as agents of industrialization in sokoto metropolis

Research Question

The research questions for the study are:

1. What are the areas basic and secondary education contributes to industrialization in Sokoto Metropolis?
2. What are the roles of basic and secondary education in promoting industrial growth in Sokoto metropolis?
3. What are the challenges faced by basic and secondary education as agents of industrialization in Sokoto metropolis?

Methodology

This study employed a descriptive analysis to examine education and industrialization nexus: an analysis of basic and secondary education as agents in sokoto metropolis, sokoto state, Nigeria. The population for this study comprises of 293 secondary schools within Sokoto metropolis. A sample size

of 120 schools was selected using research advisors (2006) Out of the 120 sampled schools, stratified random sampling technique was used to select 10 junior secondary schools and 10 senior secondary school. Stratification was done to include both public and private schools, ensuring diverse representation of schools from various socio-economic backgrounds. A total of 40 teachers (20 from technical/vocational disciplines and 20 from general education) were selected, and a total of 50 students (25 from technical/vocational subjects and 25 from general education) were also selected. 15 school administrators were also selected, and 15 industry experts were purposively selected based on their involvement in educational and industrial development. The random sampling process was guided by principles aimed at achieving balance and inclusivity. The researcher-made sixteen item structured questionnaire titled: Analysis of Basic and Secondary Education as Agents of Industrialization Questionnaire (ABSEAIQ), was developed and used to collect data for the study. The questionnaire being a closed–ended questionnaire is categorized into two sections. Section A contains the demographic characteristics of the respondents with 3 items, and section B contains the 13 items raised which are based on the research variable. The instrument of this research was validated by two experts from the department of Educational Foundations, Usmanu Danfodiyo University Sokoto. The experts vetted the questionnaire in terms of its clarity, coverage and the relevance of the items in relation to the topic under research. The experts made corrections, observations, and comments, such as restructuring of the questionnaire which initially was sectioned into three parts, noting of repetition of items, restructuring of unclear items and inclusion of research variables in items. The instrument was later adjusted to be valid for the study. Using Statistical Package for Social Sciences (SPSS version 20), the reliability coefficient yielded an ‘r’ value of 0.92 level of significance after a test re-test method was adopted on 40 teachers within Bodinga and Shagari local government areas which are outside the sample population used for the study. This study employed a descriptive analysis such as frequency tables and percentages to analyze the demographic characteristics of the respondents, while multiple regression model was employed in the bid to answer the research question raised in the work.

Results

Table 1 below shows the socioeconomic characteristics of respondents which provide a foundational understanding of the sample involved in the study. Key demographic variables analyzed include age, gender, and category of respondent. These variables help establish the credibility, diversity, and representativeness of the data collected from secondary school stakeholders in Sokoto Metropolis.

Table 1: Demographic Variables of Respondents

Variable	Categories	Frequency	Percentage (%)
Age	14 – 19 years	50	41.7%
	20 – 24 years	17	14.2%
	25 – 29 years	12	10.0%
	30 years and above	41	34.2%
Gender	Male	82	68.3%
	Female	37	30.8%
	Unspecified (Other)	1	0.8%
Category of Respondent	Students	50	41.7%
	Teachers	40	33.3%
	Administrators	15	12.5%
	Industry Experts	15	12.5%
Total		120	100.0%

The Table 1 reveals a detailed breakdown of the respondents' demographic variables such as:

Age Distribution: The majority of respondents (41.7%) fall within the 14–19-year age range, indicating strong participation from secondary school students. Respondents aged 30 years and above account for 34.2%, which likely represents more experienced professionals such as teachers, administrators, and industry experts. This spread across age groups enhances the reliability of the data as it reflects both youthful and mature perspectives on industrialization through secondary education.

Gender Distribution: The sample is predominantly male, accounting for 68.3% of the total respondents, while females represent 30.8%. One respondent (0.8%) either did not disclose their gender or selected a non-binary category. This gender distribution may reflect the gender composition within the selected institutions or the broader sociocultural context of Sokoto Metropolis. Nevertheless, both male and female voices are represented in the data.

Category of Respondents: Students constituted the largest category (41.7%), followed by teachers (33.3%). School administrators and industry experts each made up 12.5% of the sample. This distribution indicates a well-rounded respondent pool that encompasses key stakeholders in the education and industrialization process those who teach, manage, learn, and apply educational outcomes in industrial settings. In conclusion, the demographic variables of respondents demonstrate that the study engaged a diverse and representative population from various sectors associated with secondary education and industrial development. The inclusion of students, teachers, administrators, and industry practitioners across different age and gender categories provides a balanced dataset, supporting the generalizability and credibility of the findings presented in subsequent sections.

The table below presents the analysis of the data collected to address the research questions that guided the study as concerning the contributions, roles, and challenges of secondary schools as agents of industrialization in Sokoto Metropolis. The analysis is based on multiple regression analysis results obtained from 120 respondents, including teachers, students, administrators, and industry experts.

Table 2: Analysis of Research Questions and Hypothesis

Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	Std. Error	Beta		
(Constant)	.369	.262		1.409	.162
Offer of vocational subjects	.593	.155	.674	3.817	.000
Participation in practical workshops	-.099	.085	-.142	-1.164	.247
Available entrepreneurship education programs	.046	.087	.057	.526	.600
Possession of skills relevant to industrial employment	.130	.085	.181	1.540	.127
Ability of starting small-scale industries	-.874	.122	-.785	-7.163	.000
Creativity and innovation among students	.350	.132	.421	2.639	.010
Projects aligned with the needs of local industries	-.013	.110	-.013	-.115	.909

Incorporating industrial relevance into classroom teaching	.355	.082	.355	4.344	.000
Policies that promote industrial awareness	.229	.065	.301	3.546	.001
Shortage of qualified technical/vocational teachers	.060	.075	.076	.800	.425
Lack of modern equipment for industrial skill training	-.003	.131	-.003	-.025	.980
Insufficient policies	-.126	.077	-.133	-1.630	.106
Cultural perceptions	.057	.069	.064	.830	.408

The regression model above served as a proxy for assessing the operational effectiveness of basic and secondary education as contributors to industrial development. The regression results indicated a strong relationship between the independent variables and the dependent variable ($R = 0.810$), with an R^2 value of 0.656, suggesting that 65.6% of the variance in the adequacy of funding for industrial-oriented programs can be explained by the included predictors. The Adjusted R^2 of 0.614 further validates the strength and reliability of the model, accounting for potential model complexity. The ANOVA test confirmed the statistical significance of the model ($F(13,106) = 15.534$, $p < .001$), indicating that the combination of predictors reliably influences the funding challenges experienced by secondary schools.

Discussion

This study analyzed secondary schools as agents of industrialization in Sokoto Metropolis, Sokoto State, Nigeria. The analysis aimed to determine the extent of their contribution to industrial development, the roles they play in promoting industrial growth, and the challenges they encounter. These objectives were guided by three research questions, and the results were discussed in accordance with the research questions as presented below:

The research question one was addressed by examining the areas basic and secondary education contributes to industrialization in Sokoto Metropolis. Several variables demonstrated statistically significant contributions such as: the offering of vocational subjects relevant to industrial skills, which was a strong positive predictor ($B = 0.593$, $p = .000$), indicating that schools actively equipping students with industry-related skills are seen as vital contributors to industrialization. This finding is consistent with Adeyemi, (2020) assertion

that vocational and technical education is "cardinal to the socio-economic development of any nation" and an important driver of technological and economic growth in Nigeria. Similarly, teachers incorporating industrial relevance into classroom teaching (B = 0.355, p = .000) reinforces the link between pedagogy and industrial outcomes. When industrial concepts are embedded in instruction, students are better prepared for the workforce, aligning with Osundahunsi's (2019) position that vocational and technical education empowers citizens, stimulates sustained national development, and enhances employment. Promotion of creativity and innovation among students (B = 0.350, p = .010) further suggests that schools nurturing innovation are aligned with the values of a modern industrial economy (Umunadi, 2024). Administrative engagement in industrial-awareness policies (B = 0.229, p = .001) highlights the importance of leadership in steering schools toward industrial relevance.

These significant variables provide clear evidence that secondary schools in Sokoto Metropolis are actively contributing to industrial development.

The research question two was addressed through regression model which offered insights into roles of basic and secondary education in promoting industrial growth in Sokoto metropolis. Notably, innovation-driven school activities and relevant curriculum offerings reflect a systemic role in shaping students' entrepreneurial potential and readiness for industrial tasks (Adeyemi, 2020; Osundahunsi, 2019). Although entrepreneurship education (B = 0.046, p = .600) and practical workshops (B = -0.099, p = .247) were not statistically significant in this model, the strong influence of curriculum and teacher practices suggests that schools are important platforms for instilling industrial competencies (Umunadi, 2024). Interestingly, schools that produce graduates capable of starting small-scale industries had a negative relationship with funding adequacy (B = -0.874, p = .000). This may imply that successful graduate outcomes are occurring despite underfunded conditions or that these schools are being overlooked in funding allocation. These results highlight the multifaceted roles secondary schools play in promoting industrial growth from shaping skills and attitudes to creating pathways for entrepreneurship.

Furthermore, in addressing research question three, the model also shed light on several ongoing challenges: lack of significant influence from key variables such as the availability of modern equipment (B = -0.003, p = .980), shortage of qualified technical/vocational teachers (B = 0.060, p = .425), and

government policy support (B = -0.126, p = .106). These findings suggest that while these challenges are present, they may not be adequately addressed or reflected in funding decisions. This observation is consistent with Osundahunsi's (2019) view that for vocational and technical education to fulfil its developmental potential, adequate resources and supportive policies are critical. Additionally, the strong negative relationship between graduate entrepreneurship and funding adequacy suggests a systemic challenge: schools that are producing industry-ready graduates may not be receiving proportional support, possibly due to ineffective funding mechanisms or misaligned evaluation criteria. Hence, despite their efforts and outcomes, secondary schools face notable challenges in fulfilling their industrial role.

Conclusion

This study critically examined the role of secondary schools as agents of industrialization in Sokoto Metropolis, Sokoto State. Through the analysis of various school related variables including curriculum relevance, teacher practices, administrative policies, infrastructure, and student engagement. The study sought to evaluate the extent of secondary schools' contributions to industrial development, their role in promoting industrial growth, and the challenges they face. These findings reinforce the urgent need for educational policy reforms, increased funding, teacher training, and stronger school-industry collaboration to enhance the capacity of secondary schools to serve as true agents of industrial transformation.

The findings revealed that secondary schools make significant contributions to industrialization through the provision of vocational subjects, the integration of industrial relevance in classroom teaching, the promotion of creativity and innovation, and the adoption of policies that foster industrial awareness. These outcomes underscore the pivotal role of secondary schools in equipping students with the knowledge, skills, and mindset necessary for industrial participation and entrepreneurship. However, the study also identified key challenges that hinder the effectiveness of secondary schools in this role. These include inadequate funding, insufficient modern equipment, lack of qualified technical teachers, and gaps in government policy implementation. The presence of these obstacles indicates that while the foundational structures for industrial-oriented education exist, they are underutilized due to systemic constraints.

Based on the results, the three null hypotheses were rejected, confirming that secondary schools in Sokoto Metropolis contribute meaningfully to industrialization, actively promote industrial growth, and simultaneously face significant challenges in executing their industrial mandate. In conclusion, for secondary schools to fully realize their potential as catalysts for industrial development, there must be a concerted effort by educational stakeholders, government agencies, industries, and communities. With adequate support, policy alignment, and strategic investment, secondary schools can serve as effective incubators for Nigeria's future industrial workforce and innovators.

Recommendation

In light of the findings from this study, the following recommendations are proposed to strengthen the role of secondary schools as agents of industrialization in Sokoto Metropolis, Sokoto State:

1. Enhance curriculum relevance to industrial needs
2. Invest in teacher training and professional development
3. Strengthen school leadership for industrial advocacy
4. Improve infrastructure and equipment availability
5. Foster industry-school collaboration.

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Effectiveness of Study Skills Training on Motivation and Academic Performance in Mathematics among Secondary School Students in Katsina State, Nigeria

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Abstract

This study investigated the Effect of Study skills Training on Motivation and Academic Performance in Mathematics among Secondary School Students in Katsina state, Nigeria. Two objectives with corresponding null hypotheses guided the study. Quasi-experimental design pre-test, post-test and control group was adopted for the study. The population consists of 17,257 students; the sample size of this study consists of 115 SSS II Science intact-class Students which were drawn from two public co-educational schools in Katsina Zonal Education Quality Assurance in Katsina State, Nigeria. Multi-stage sampling technique was adopted for the study; purposive sampling technique was used to select two schools for the study. The study consists of experimental group and control group. The instruments are Students' Mathematics Motivation Questionnaire (SMMQ) and Mathematics Academic Performance Test (MAPT). The reliability co-efficient of SMQ and MAPT are 0.75 and 0.78 respectively. ANCOVA was used to test the hypotheses at 0.05 level of significant. The finding revealed that there is significant difference between students taught Mathematics using study skills training and those taught using conventional strategies on Motivation in Mathematics and the finding revealed that there is significant difference between students taught using study skills training and those taught using conventional strategies on academic performance in Mathematics. The study concluded that study skills training are more effective than conventional method of teaching in improving students' motivation, enhancing students' academic performance when teaching the difficult concept of Mathematics.

Keywords: Academic Performance, Students' Motivation, Study Skills Training, Secondary School Students

Introduction

Mathematics is a fundamental part of human thought and logic, and integral to attempts at understanding the world and ourselves. The study of mathematics as a subject helps Senior Secondary Students in ordering, organizing and investigating their environment and contributes to individual self development through performance (Musa, & Adamu, 2019). Mathematics assist us to

develop critical thinking, problem-solving and logical reasoning skills that are essential for individuals' success in various fields of human endevours. Students' academic performance in mathematics varies across different nations due to the difference in the adopted teaching strategy as well as students' study skills. Therefore, there is a need for teachers and others stakeholder in the educational sector to pay proper attention to the teaching and learning of Mathematics (Onoshakpokaiye, 2021).

Academic performance is related to students' motivation, because motivation played central role in illuminating the understanding of student performance and played important role for all human endeavour. Motivation is a psychological construct which explains purposive or goal direct behaviour in human beings. According to Oyinvwi and Onunu, (2021) motivation as a psychological process which leads anyone to act in a way that helps him/her to fulfill unsatisfied needs. Motivation is a process of arousing action, sustaining activity in progress, regulating and directing pattern of activity through energy transformation within the tissues of the organism (Debasmita, 2023). Motivation as a concept introduced to implored individual in understanding of their behaviour as human beings. It is a psycho-physiological drives, initiated by some need, which prompt to an activity to satisfy individuals' need.

When individuals are motivated in learning, it is likely to be related with their study skills, according to Chukwu et al. (2022) which encompass a range of coordinated cognitive skills and procedures that enhance the effectiveness and efficiency of students learning. It is indicated that, study skills include the competencies associated with acquiring, recording, organizing, synthesizing, remembering and using information. Kerka (2017); Chukwu et al. (2022) opined that study skills are learning strategies that help students organize process and use information effectively. Students' study skills should not be overlooked since it contributes to their good academic performance in mathematics. Onoshakpokaiye, (2021) shows that students with effective study skills excel in their learning and also students who possess good study skills performed significantly better than those students with bad study skills in mathematics. Since, study skills help students to organize and process information, to remember what they have learned and conscious of their learning processes, it need to learned by student through the effort of teacher in a classroom organization.

It is suggested that study skills training are learning strategies that help students organize process and use information effectively (Kerka, 2017; Chukwu et al., 2022). Study skill training is a strategy that helps students improves their learning habits and skills, such as summarizing, outlining, self-questioning, and time management (Brown, 2019). Effective study skills must be comprised of specific tactics and/or strategies, which can consistently be drawn upon by the learner as a means of organization, retention, and processing of information (Amin et al., 2020). For instance, a study tactic could be a specific procedure, such as underlining, note-taking, and summarizing. Such techniques are often taught through instruction wherein the skill is presented, but not practiced; therefore, the flawed assumption that knowing study tactics equates to individuals' effective studying.

Therefore, study skills training must be taught, practiced and ingrained into habitual usage, which in turn improves confidence, work-ethic and inner students' motivation. The Study skills training program comprehensively tackled both the intellectual and non-intellectual aspects required academic proficient study skills (Dweck, 2005). The student meets one-on-one with a teacher in a classroom setting for instruction in basic study skills, which are then practiced, encouraged and refined throughout the course and training. The students are provided with information for practical study tactics and techniques, while also addressing a growth mindset through goal setting, motivation for academic improvement (Dweck, 2005).

In addition, it should be noted that study skills training can improve students' study habits, it may also lead to better scores and academic performance improves gradually (Musa & Adamu, 2019). Study skills training are teachings or tutorials given to students in different areas of learning in order to help them adopt appropriate ways of studying for academic excellence (Israel & Bahago 2020). According to Chukwu et al. (2022) study skills training as teachings given to students in order to help them utilize a process of thinking which includes the steps of recognizing, recalling, and executing particular steps in acquiring study skills. Scholars Oladunmoye et al. (2023); Ihianakuihiomen (2022) asserts that study skills training helps students prepare, plan, select, comprehend points when reading, ask and answer questions, review, recite, and recall what has been learned, acquire greater confidence to prepare for tests and examinations. Therefore, when low achieving students are trained in study skills, they become exposed to different

learning materials which will in turn help them adopt appropriate studying, become competent and confident learners, thereby making learning interesting and as well attaining academic excellence.

Researcher such as Jolly and Sethi (2024) revealed that there was significant difference effect of study skills training on academic motivation among students. Hossein and Marjan (2014) revealed a positive significant effect of motivation on mathematics performance as regard to study skills. Also, Johnry et al. (2022) Students' motivations have direct effects on mathematics academic performance. The study of Oladunmoye et al. (2023) revealed that study skills training group scored higher than the control group. Michael et al. (2020) show that there was significant effect of study skills on academic performance of students. Study skills training are techniques that can be learned to aid students to learn better in a given learning environment. There are a variety of different study skills for the purpose of this research study that will be used by student to improve their learning abilities. These skills include: Goal-setting and Motivational skills, Organizing and processing information skills, Study habits and planning skill, Mathematic abilities working skills, Concentration and memory training skills, Note-taking skills, Test/Exam-taking abilities, Homework/Assignment strategies and Time management skills (Israel & Bahago, 2020). The essence of training students in study skills is to help students identify appropriate skills to be use in every learning mathematical process, as mathematics is important in all sciences such as engineering, technology, medical science, humanity disciplines and scientific disciplines.

Statement of the Problem

The quality and effectiveness of mathematics teaching and learning has been major challenges in educational system. Various factors have been identified such as poor motivation, low academic performance, poor communication skills, emotional instability, poor teacher's instructional strategies and ineffective classroom managements in secondary schools in Katsina State (Usman, et al. (2023). Poor motivation can be interpreted as an uncaring attitude toward what one supposed to do; it has been experienced by everyone, including students. It's a situation where a student does not want to learn due to the difficulty in following the lesson procedures delivered by the teacher. Poor motivating students have deficient level of passion and enthusiasm in doing an academic task (Sasson, 2019). The reasons why students become

unmotivated are due to the teacher being unclear in delivering the lesson, having low self-confidence, dissatisfaction while learning and personal problems from students. According to Moreira-Morales and García-Loor (2024); Zambuk (2021) asserted lack of motivation is a contributing factor to secondary school student failure in most subjects. Therefore, unless students are well motivated in learning using study skills and have strong confidence of the educational system else teaching and learning might not happen. Therefore, rise in levels of students' motivation may lead to better academic performance which might be guaranteed for the achievement of educational goals. Hence it is against this background that, the researcher study investigated the effect of Study Skills Training on motivation and academic performance in Mathematics among Senior Secondary School students' in Katsina State, Nigeria.

Table 1: Summary of Study Skills Training for Eight weeks

Sessions	Summary of the content of the sessions
First week	Creating rapport, Introduction of Study skills training, administer of pre-test
	Goal-setting and Motivational skills: encourage the students to set achievable goals, self-motivation in learning Mathematics
Second week	Organizing and processing information skills: encouraged students to organize their own learning information and contribute to the class discussions.
Third week	Study habits and planning skill: encouraged students to demonstrate planning skills and study habits in learning Mathematics concepts.
Fourth week	Concentration, memory training skills and Note-taking skills: student to always concentrate, proper training of memory through in Mathematic note-taking
Fifth week	Time management skills. students to be time manager in organizing learning material in Mathematics class
Sixth week	Homework/Assignment strategies: encouraged students to ask questions and engage in homework/assignment in Mathematics.
Seventh week	Mathematical abilities and Test/Exam-taking abilities: solving problems and implore test/examination on topic taught.
Eighth week	Study skills evaluation. Examined learner, reflection, feedback, post-test

Sources: Researchers' Design Model, (2025)

Objectives of the Study

The objectives of the study are to:

1. examine the effect of study skills training on motivation among secondary school students in Katsina state.

2. examine the effect of study skills training in improving academic performance in mathematics among secondary school students in Katsina state.

Research Hypotheses

The following hypotheses were formulated for the research:

H_{O1}: There is no significant differential effect of study skills training on motivation among secondary school students in Katsina state.

H_{O2}: There is no significant differential effect of study skills training in improving academic performance in mathematics among secondary school students in Katsina state.

Methodology

The study adopted a quasi- experimental research design of pre-test, post-test type and control group design. The research adopted 2x2x2 factorial design for the study, experimental group (EG) taught using the Study skills training while the control group (CG) was taught by using the conventional method where the teacher delivered the teaching and led the students in understanding the lessons in the classroom. The choice of the design is because the researcher does not intend to distort the normal academic activities of the sampled schools. The population of the study is the entire students of senior secondary school students in Katsina Zonal Education Quality Assurance, (KZEQA) Katsina state which comprising the total of one hundred and fifty-one (115) students, the experimental group was 76 and control group was 39 SSS II science students.

The multi-stage sampling technique was adopted to draw twenty-three (23) secondary schools sample across four stages. At stage one, schools in the three (3) local government areas were adequate coverage. At stage two, purposive sampling technique was used to select two mixed senior secondary school for the study. Purposive sampling technique was used to select two schools of which they are (SSS II) Science intact-class from the total number of schools in the zone. The justification for the selection of these two senior secondary schools was to enable the researchers to carry out their research for effective and efficient result. At stage three, two mixed senior secondary school were

assigned to the groups. At final stage, the participants were identified as intact-class of SSS II science students

The participants were drawn from two intact classes in two selected from two different co-educational senior secondary schools in KZEQA. The experimental group (EG) has a total number of 76 students, while exposed to training while the control group (CG) has a total number of 39 students.

Experimental Procedure

These diagrams illustrate the design on Students' Motivation and Academic Performance as represented in the following figures:

Group A (EG) Study Skills Training $O_1 \longrightarrow X_1 \longrightarrow O_2$

Group B (CG) Conventional Teaching Method $O_1 \longrightarrow X_0 \longrightarrow O_2$

EG= Experimental Group - exposed to SST, $\mathbf{X_1}$= Study Skills Training (SST)

CG = Control Group - exposed to CTM, $\mathbf{X_0}$= Conventional Teaching Method (CTM)

$\mathbf{O_1}$ = Pre-test $\mathbf{O_2}$ = Post-test

Three research instruments were used for this study. The instrument, were tagged Students' Mathematics Motivation Questionnaire (SMMQ) and Mathematics Academic Performance Test (MAPT). Students' Mathematics Motivation Questionnaire (SSMQ) which consists of twenty (20) items and was adapted from Fiorellaet al. (2021) for the purpose of this study. It's consists of 20 items on Mathematics Motivation Questionnaires which was used to measures individual's level of motivation in mathematics and how it influence their academic pursuit. The questionnaire was based on a four-point Likert type Scale ranging from Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). MAT consists of 25-item multiple choice questions with four options adapted from West African Senior School Certificate Examination (WASSCE) to serve as pretest to ascertain equivalence of ability of subject and as post-test to determine the effect of the treatment on students' academic performance based on algebraic and quadratic equation. To ascertain the validity of the instrument, the instrument was given

to two expert from the Department of Science Education (Mathematics Lecturer) and Department Educational Psychology and Counselling, Federal University, Dutsin-ma, Katsina state, to establish the face and content validity of instrument, also to correctness of questions and options. They evaluated the instrument for its validity for accuracy and clarity of the test items for the study. To ascertain the reliability of instrument, it was administered to a group of 25 SSS II students of intact (Science) class of in a school outside the scope of the study. The scores were subjected to Split-half Statistical Analysis, the reliability co-efficient of SMMQ and MAPT are 0.75 and 0.78 respectively.

The study involved two groups a pre-test was administered to two classes were assigned to groups (Experimental group and Control group). This enabled the researcher determine the performance status of the subjects before treatment. The study was conducted in three phases: pre-experimental activities, experiment proper and post-experimental activities: The first phase consists of administering the pre-tests of motivation questionnaire and mathematics test-items on students, after securing permission from the school principal. In the second phase, the experimental group was exposed to (trigonometric ratios) and the control group to the conventional teaching method. The final phase of the study was the administration of the post-tests. The same assessment procedure was used for both groups and ensures objectivity in the conduct of the study. Both groups were taught using appropriate lesson plan. Post tests were administered to both groups after the completion of treatment. The instruments for data collection for this study were administered to the students before and the treatment. After treatment, a post-test was administered to all the subjects in both groups. Scores obtained at this stage served as pre-test scores. To determine if significant difference exists between the pre-test and post-test mean scores of each group, the Analysis of Covariance (ANCOVA) was employed for the research study. All the hypotheses were tested at 0.5 level of significance.

Results

Hypothesis One

There is no significant differential effect of study skills training on motivation among secondary school students in Katsina state.

Table 2: ANCOVA of Motivation scores of Experimental Group 2 and Control Group

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2281.764[a]	2	1140.882	139.257	.020
Intercept	239.994	1	239.994	237.226	.000
Motivation Pretest	121.002	1	121.002	2.002	.096
Treatment 2	281.706	1	281.706	278.457	.004
Error	83.996	83	1.012		
Total	33613.000	86			
Corrected Total	415.304	85			

a. R Squared = .697 (Adjusted R Squared = .674)

Table 2 shows the ANOVA analysis of pre-test score of experimental group 2 and control group, F-value obtained is {F (1, 83) = 278.457; $p < .05$}. Since the p-value of .004 is less than the alpha level of .05; it also revealed that (R^2 = .697) 69.7% of variance in post-test scores can be explained by the treatment. The Adjusted R^2 = .674, indicating a high and indicates a strong explanatory power of the intervention and other factors. It can therefore revealed, that to a large extent, SST was effective in improving the motivation of students toward learning Mathematics. Therefore, the null hypothesis was rejected; this indicates that there was significant effect of study skills training on motivation among secondary school students in Katsina state.

Hypothesis Two

There is no significant differential effect of study skills training in improving academic performance in mathematics among secondary school students in Katsina state.

Table 3: ANCOVA of Academic performance scores of Experimental Group 2 and Control Group

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2739.322[a]	2	1369.661	43.321	.090
Intercept	2214.804	1	2214.804	61.419	.500
Academic PerfPretest	482.768	1	482.768	13.387	.008
Treatment 2	1315.650	1	1315.650	18.214	.020
Error	3038.630	83	36.061		
Total	353609.000	86			
Corrected Total	52207.507	85			

a. R Squared = .578 (Adjusted R Squared = .716)

Table 3, shows the ANOVA analysis of pre-test score of experimental group 2 and control group, F-value obtained is {F (1, 83) = 18.214; p < .05}. Since the p-value of .020 is less than the alpha level of .05; it also revealed that (R^2 = .578) 57.8% of variance in post-test scores can be explained by the treatment. The Adjusted R^2 = .716, indicating a high and indicates a strong explanatory power of the intervention and other factors. It can therefore revealed, that to a large extent, SST was effective in improving the academic performance of students toward learning Mathematics. Therefore, the null hypothesis was rejected; this indicates that there was significant effect of academic performance among secondary school students in Katsina state.

Discussion

The findings of hypothesis one shows the effectiveness of study skills training in improving motivation among secondary school students in Katsina state. The findings of this study corroborate with Jolly and Sethi, (2024) whom the results revealed that there was significant difference effect of academic motivation on study skills among students. The finding also agree with that of Hossein and Marjan (2014) who results also revealed a positive significant effect of motivation on mathematics performance as regard to study skills.

The finding of hypothesis two shows the effectiveness of mindfulness training in improving academic performance among secondary school students in Katsina state. The finding of the study is in line with Oladunmoye et al. (2023) who result revealed that study skills training group scored higher than the control group. The finding also agree with that of Michael et al. (2020) whom result of the study revealed that the experimental group that was given study skills training performed higher than that of the control group there was significant effect of study skills on academic performance of students. In contrary, the finding of this study was not in line with the views of Huy et al. (2022) whom found no differences in study skills on the academic performance across the two groups. This study also agreed with the Elger (2007) theory of performance on the core components of a performance as identity, learning skills, knowledge, context, personal factors and fixed factors.

Conclusion

Based on the findings, it was concluded that study skills training was more effective than conventional method of teaching in enhancing students' academic motivation when teaching the difficult concept of mathematics.

However, study skills training of teaching was found effective in enhancing student motivation and academic performance.

Recommendations

Based on the findings and the conclusions reached, the following recommendations were made:

1. Teachers of Mathematics should make effective use of study skills training in the teaching of mathematics as it improves students' academic motivation and learning

2. Seminars, conferences and workshops should be organized by the government for Mathematic teachers for more enlightenment on effective utilization of study skills training strategy.

3. Educational policy makers such as National Education Research Development Council (NERDC), Curriculum planners and Ministry of Education, should incorporate the use study skills training strategy in the curriculum.

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Leveraging Artificial Intelligence for Inclusive Education in Nigeria to Enhance Educational Opportunities for Diverse Learners

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Abstract

This paper x-rayed the transformative potential of Artificial Intelligence (AI) in promoting inclusive education within the Nigerian context. As Nigeria is faced with persistent perennial challenges in providing accessible and equitable education for all learners especially those with special challenges and those with diverse cultural and linguistic backgrounds; there is need to encourage leveraging AI as potent strategy to bridge educational disparities. The study adopts a multidimensional perspective in focusing on three central pillars: the integration of assistive technologies, the advancement of personalized learning pathways, and the fostering of accessibility innovations. These components are discussed in relation to contextual variables such as teacher digital competence, infrastructural readiness, policy environment, and socioeconomic disparities that influence adoption and effectiveness of AI tools in Nigerian classrooms. Supported by the construct of inclusive pedagogy, a conceptual framework was proposed to illustrate how AI enhance learners' participation, autonomy and achievement. By contextualizing global innovations within Nigeria's unique socio-cultural and infrastructural realities, practical and policy-relevant insights are proffered on how AI can be harnessed to supplement existing educational practices and to fundamentally reshape them toward greater equity and inclusion. It was suggested that stakeholders should collaborate on inclusive and relevant AI solutions.

Keywords: Artificial Intelligence, Inclusive Education, Assistive Technologies, Personalized Learning, Accessibility Innovations

Introduction

Education is a fundamental human right and a cornerstone for national development when judiciously access with emerging educational technologies.

Educational technology has been known for playing a transformative role in bridging the digital divide, promoting equitable access to technology-enhanced learning, improving educational outcome of students irrespective of their gender and socio-economic backgrounds; supporting digital literacy, interactive learning and skill acquisition (Adenubi *et al.,* 2025). Samuel (2021) averred that traditional approaches to teaching and learning are gradually losing their effectiveness in engaging learners and fostering optimal educational outcomes. The continuous global advancement in learning made educational institutions to increasingly adopt variety of methods, strategies, and media to enhance pedagogical experiences. This dynamic nature of education and engagement of newer technologies brought about innovative communication, teaching and learning process to leverage the evolving needs of students (Adenubi *et al.,* 2024).

However, the concept of inclusive education**,** which advocates for equitable participation of all learners regardless of their cognitive, physical, linguistic, or socio-economic conditions, which remain as a significant challenge in many developing countries, especially Nigeria (UNESCO, 2021; Adebayo, 2022). Despite national and international policy commitments such as Nigeria's National Policy on Special Needs Education as contained in Federal Republic of Nigeria (2008) and Sustainable Development Goal 4 (which aims to ensure equitable and inclusive quality education for all), the implementation remains far from adequate. Nigeria's educational landscape is marked by stark disparities in access, participation, and outcomes due to perennial challenges facing the nation educational system. Some of these challenges are: over 20 million out-of-school children (UNICEF, 2023), poor infrastructure, limited teacher capacity and insufficient provision and of learning tools that are tailored for special needs learners reflect systemic exclusion (UBE Commission, 2020; Okebukola, 2020).

According to (Samuel, 2021), Nigerian learning institutions have grappling with inadequate digital infrastructure facilities, inadequate teacher training and insufficient policy support for teacher professional growth. As a result these perennial challenges, Nigerian education system is at risk of falling further behind in achieving equitable and quality education for all and dry. Moreover, the vast digital divide between urban and rural communities impedes equal access to innovative educational technologies that can support inclusive practices. Recent technological advancements, especially in the deployment of Artificial Intelligence (AI) in facilitating**,** offer promising avenues to transform

education delivery by supporting personalized learning**,** real-time assessment**,** language translation**,** and assistive technologies for learners with disabilities (Alabi, Ojo & Musa, 2023). AI-powered tools can customize instructional content based on individual learner profiles, ensuring that no one is left behind (Adedoyin & Soykan, 2020). For instance, speech-to-text, text-to-speech, predictive text applications, emotion detection, and AI-driven reading support tools can enhance learning for visually and hearing-impaired students (Adu et al., 2021).

However, the integration of AI for inclusive education in Nigeria remains under-explored. While private institutions and international schools are experimenting with AI and assistive learning technologies, the majority of Nigerian public schools lack the infrastructure, policy frameworks, and skilled workforce to adopt such innovations effectively (NERDC, 2021; NCC, 2022). Additionally, little research exists on how AI solutions can be customized to fit Nigeria's multi-lingual, multicultural, and infrastructurally disadvantaged educational system.

Despite global advancements in AI-driven inclusive education, empirical and contextual studies exploring the integration of these technologies in the Nigerian educational system are sparse. Specifically, the following critical research gaps exist: Limited contextual evidence on the effectiveness of AI-powered assistive technologies for learners with disabilities in Nigerian primary, secondary, and tertiary education settings (Adebayo, 2022; Oyelekan & Agagu, 2020); lack of comprehensive studies on how AI-driven personalized learning tools can be integrated into Nigerian curricula, especially in low-resource and multilingual learning environments (Ajayi, 2020; Alabi et al., 2023); few frameworks exist that link accessibility innovations (e.g., speech recognition, screen readers, localized language AI) to Nigeria's inclusive education goals - most current discussions are policy-based but not technologically focused (NERDC, 2021**);** limited exploration of the readiness of Nigerian teachers, administrators, and learners to adopt AI tools for inclusion, in terms of digital competence, infrastructural access, and curriculum alignment (Adedoyin & Soykan, 2020); and scant attention has been given to rural and underserved communities**,** where the inclusive potential of AI could be most transformational but where systemic neglect and infrastructural limitations are most severe (UNICEF, 2023; UBE Commission, 2020).

Moreover, despite Nigeria's policy commitment to inclusive education through frameworks such as the National Policy on Education (FRN, 2013) and the National Policy on Special Needs Education (2008), the practical realization of inclusive education remains elusive. Millions of Nigerian learners, particularly those in rural communities, those with special challenge, and those from economically disadvantaged backgrounds, continue to face significant perennial challenges to quality education due to inadequate infrastructure, poorly trained teachers, and lack of accessible learning materials (UNESCO, 2021; UBE Commission, 2020). The prevalence of out-of-school children in Nigeria currently estimated at over 20 million, which seemingly be the highest in the world - is a stark indicator of systemic exclusion (UNICEF, 2023). Many of these children are either affected by insecurity, disability, or socio-economic challenges, underscoring the urgent need for innovative approaches to deliver equitable learning experiences. Additionally, learners with special challenges or disabilities are often excluded from mainstream education due to lack of trained personnel, limited assistive technologies and non-adaptive curricula (Adedoyin & Soykan, 2020; Adebayo, 2022).

Most public schools in Nigeria do not have adequate technological infrastructure facilities required to support special challenges like hearing-impaired, visually impaired, or cognitively challenged students (Oyelekan & Agagu, 2020); even non-physically challenge children in the rural areas are not enjoying the engagement of newer technologies. This situation further widens the educational gap and reinforces systemic inequities. Moreover, Nigeria's linguistic and cultural diversity - home to over 500 languages compounds the challenge of delivering personalized and inclusive instruction. English-centric digital learning tools marginalize a significant portion of learners who are more proficient in indigenous languages (Ajayi, 2020). The absence of localized, inclusive content exacerbates learning difficulties, especially at the foundational level.

The advent of Artificial Intelligence (AI) offers unprecedented opportunities to overcome these barriers. AI-powered systems, including assistive technologies, adaptive learning platforms, and accessibility tools, have the potential to bridge gaps in access, personalize learning, and support learners with special needs (Okebukola, 2020; Alabi, Ojo & Musa, 2023). However, AI adoption in Nigeria's education sector is still at a nascent stage, with low integration in classroom settings, minimal awareness among educators, and

lack of supportive digital infrastructure (Adu, Olaleye & Adefeso, 2021). The digital divide persists between urban and rural areas, limiting the potential reach of AI solutions. Many rural schools lack electricity, internet connectivity, and basic digital devices, making equitable deployment of AI-driven solutions challenging (NCC, 2022; NERDC, 2021). Additionally, teachers often lack the necessary digital competence and inclusive pedagogical training to effectively utilize AI tools for differentiated instruction (Adedoyin & Soykan, 2020).

Elucidating on these challenges, it is imperative to explore how AI-enabled assistive technologies, personalized learning systems, and accessibility innovations can be leveraged to enhance educational opportunities for diverse learners in Nigeria. Without a strategic framework for integrating AI into inclusive education practices, the nation risks reinforcing existing disparities and failing to meet its education-for-all obligations under global agreements such as SDG 4 (UNESCO, 2021). Therefore this is study explores the potential of leveraging AI for inclusive education in Nigeria by focusing on the intersection of assistive technologies, personalized learning**,** and accessibility, innovations, current level of readiness, barriers to implementation, and opportunities for scaling AI-enabled inclusive practices across educational settings in Nigeria.

In response to the persistent challenges undermining the inclusivity of Nigeria's educational system, it is pertinent to bridge critical gaps through a multifaceted approach of using the engagement of Artificial Intelligence for inclusive education in Nigeria learning institutions to enhance educational opportunities for diverse learners. This study proposes a contextual implementation model, articulated through a conceptual framework that demonstrates how AI-enabled tools can effectively be adapted to Nigeria's inclusive education landscape, taking into account infrastructural limitations, linguistic diversity, and socio-cultural complexities. Secondly, policy and practice alignment will be emphasized by offering actionable recommendations to inform national strategies for AI integration in inclusive education, thereby addressing disconnect between existing educational policies and the rapid evolution of technology. Furthermore, preparedness of educators, administrators and policymakers on digital integration and pedagogical readiness seemed questionable. Therefore, periodic assessments of educational stakeholders' capacity will help in identifying specific training

requirements and infrastructural gaps that are necessary for effective AI deployment in inclusive settings. The principle of equity through innovation by exploring scalable, cost-effective, and locally relevant AI solutions aimed at reducing educational disparities particularly for learners with disabilities and those in underserved or marginalized communities becomes very necessary.

Justification for the Inclusiveness of the Framework into the Nigerian Educational System

The framework's inclusiveness was justified based on the following constructs authorities:

a. Policy Alignment: The proposed AI-integrated framework aligns with Nigeria's national education and digital policies while addressing their gaps in inclusivity. It complements the National Digital Economy Policy (2020–2030) by embedding equity for marginalized learners and supports inclusive goals of the National Policies on Education (2013) and ICT in Education (2019). Globally, it reflects the mandate of SDG 4 for inclusive education. Empirical evidence (Afolabi et al., 2021; Adebayo & Omodan, 2022) reinforces the need for policy-aligned, localized AI solutions (Alhassan, 2020) to reduce educational inequities.

b. Equity: The framework embeds equity by prioritizing adaptive, accessible AI tools that serve learners with disabilities and underserved populations. This ensures inclusive access, participation, and outcomes, in line with UNESCO (2020) and World Bank (2020) recommendations. In Nigeria's context of infrastructural and socio-economic disparities, such targeted interventions are vital for achieving educational justice.

c. Access**:** AI-powered mobile tools expand learning opportunities for students in remote and low-income areas by overcoming physical and financial barriers. With increasing mobile penetration in Nigeria (NCC, 2022), such tools ensure broader reach, especially where traditional infrastructure is lacking (Olaniyi et al., 2021).

d. Relevance: The framework integrates local languages, indigenous knowledge, and culturally responsive content to reflect the lived

experiences of Nigerian learners. This boosts learner engagement and contextual understanding (Ajayi, 2020; Adewumi & Olatunji, 2021).

e. Feasibility: By leveraging low-cost and scalable AI applications that function in resource-constrained environments, the framework ensures practical implementation in underserved schools (Adu et al., 2021; Alabi et al., 2023).

f. Sustainability: Long-term impact is achieved through AI-driven automation, teacher augmentation, and alignment with national education policies, ensuring continuity and systemic integration (Okebukola, 2020; Adedoyin & Soykan, 2020).

g. Empowerment: The framework enhances teacher digital literacy and pedagogical effectiveness while promoting learner autonomy and critical thinking through intelligent tutoring and personalized feedback (Oyelekan & Agagu, 2020; Yusuf & Onasanya, 2021).

h. Diverse Learner Needs: With Nigeria hosting the largest population of out-of-school children in Sub-Saharan Africa—many of whom have disabilities—the framework ensures inclusive approaches that address cognitive, physical, and socio-economic learning differences (UNICEF, 2023).

i. Digital Divide: Marked disparities in digital access between urban and rural areas necessitate offline-capable, AI-driven solutions that are cost-effective and adaptable to varying levels of connectivity (Okebukola, 2020).

j. Language Barriers: AI-powered speech synthesis and translation tools are critical in navigating Nigeria's multilingual context, ensuring that language does not hinder educational access and comprehension (Ajayi, 2020).

The proposed conceptual framework for the integration of artificial intelligence in Nigerian educational system is presented hereunder, showing the key constructs and variables for the inclusiveness and inclusive education outcomes from it.

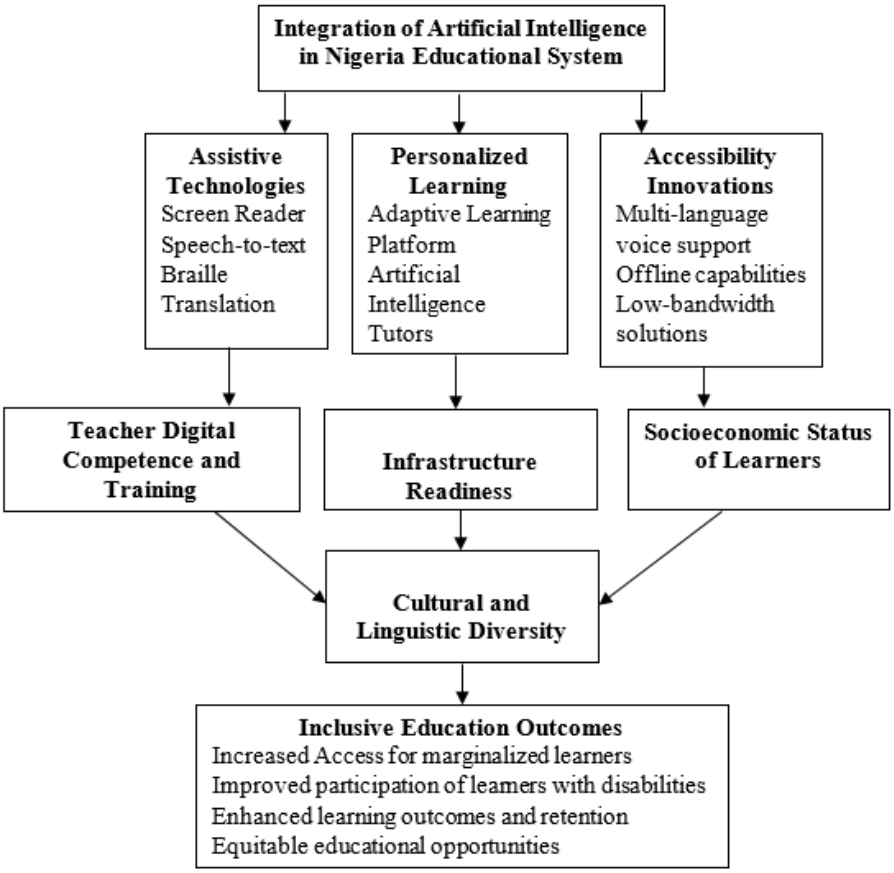

Figure 1: Propose Conceptual Framework for Integrating Artificial Intelligence in Nigerian Educational System

Figure 1 presents a conceptual framework that illustrates how Artificial Intelligence (AI) can be integrated into Nigeria's education system to support inclusive education by focusing on assistive technologies**,** personalized learning**,** and accessibility innovations**,** while addressing contextual challenges such as infrastructure deficits, teacher readiness, language diversity, and socioeconomic disparity. It illustrates a context-aware model for integrating Artificial Intelligence (AI) in Nigeria's educational system, with a strong emphasis on inclusion, equity, and cultural relevance. The key components of the framework are contextual discussed hereunder:

1. Central Focus: Integration of Artificial Intelligence in Nigeria's Educational System: at the core of the framework is the integration of AI into education and not just as a technological enhancement, but as a strategic approach to

address systemic barriers, foster equity, and improve learning outcomes, especially for marginalized populations.

2. Key Pillars of Integration

(1) Assistive Technologies: These tools (e.g., screen readers, speech-to-text, Braille support) are crucial for learners with disabilities, ensuring that AI does not widen existing inequalities but instead removes access barriers.

(2) Personalized Learning: AI enables adaptive learning platforms and intelligent tutors that tailor instruction to individual learner needs, pacing, and abilities. This personalization is vital in Nigeria's diverse educational landscape, where learners often face overcrowded classrooms, under-resourced schools, and language barriers.

(3) Accessibility Interventions: Features such as multi-language voice support, offline capabilities, and low-bandwidth optimization directly respond to infrastructural and socio-economic disparities across Nigeria. These interventions help ensure AI solutions are inclusive, not exclusive.

3. Supporting Conditions for Success

i. Teacher Digital Competence and Training: Teachers are pivotal in AI integration. Their digital literacy, willingness to innovate, and ongoing professional development are central to ensuring that AI tools are effectively and ethically deployed in the classroom.

ii. Infrastructure Readiness: Reliable power, internet access, and devices form the technological backbone. Without infrastructure support, AI tools may fail to scale or may exacerbate the urban-rural digital divide.

iii. Socioeconomic Status of Learners: AI tools must be designed to function in low-income environments, ensuring students from all backgrounds can participate. This entails low-cost devices, subsidized platforms, and public investments in digital equity.

4. Cross-Cutting Consideration: Cultural and Linguistic Diversity: A key cross-cutting consideration in the framework is Nigeria's cultural and

linguistic diversity. Given the country's multilingual and multicultural context, AI solutions must support local languages, region-specific content, and culturally relevant pedagogy. This approach not only fosters inclusivity but also reinforces learners' identities and enhances their engagement with the educational process.

5. Expected Inclusive Education Outcomes: The framework envisions inclusive education outcomes that prioritize equity and accessibility. It aims to increase access for marginalized groups, improve learning outcomes for students with disabilities, and enhance teacher support through AI-driven tools. Additionally, it promotes equitable participation in digital education, ensuring that all learners regardless of ability, location, or background benefit from technology-enhanced learning. These outcomes align with Nigeria's National Policy on Education (2013), the ICT in Education Policy (2019), and the global objective of SDG 4, which advocates for inclusive, equitable, and quality education for all.

This AI integration framework is strategic, inclusive, and contextually grounded, offering a realistic pathway to transform Nigeria's educational system. It acknowledges local constraints while leveraging AI's potential to bridge access gaps, personalize learning, and promote social equity especially for disadvantaged groups. Its success, however, hinges on policy support, stakeholder collaboration, and sustained investment in infrastructure and capacity-building.

Description of the Synergistic Interrelationships

The proposed framework for integrating Artificial Intelligence (AI) into Nigeria's educational system reveals a layered, interdependent structure aimed at fostering inclusive education. At its core, AI integration activates three interlinked pathways assistive technologies, personalized learning, and accessibility innovations all contributing to enhanced inclusion across diverse learner groups.

AI-powered assistive tools like screen readers and speech-to-text applications help bridge accessibility gaps for students with disabilities, particularly in underserved and infrastructure-deficient areas where traditional support systems are lacking (Adebayo, 2022). Personalized learning, driven by AI, adapts content to individual learner profiles and paces, a critical intervention in Nigeria's overcrowded classrooms where individualized instruction is rare

(Alabi et al., 2023). Meanwhile, accessibility innovations such as multilingual translation and voice-enabled apps address Nigeria's vast linguistic diversity, mitigating language barriers and affirming cultural identities (Ajayi, 2020).

However, several moderating factors shape the potential impact of these AI-driven pathways. Teacher digital competence is vital, as the effectiveness of AI tools depends on educators who are confident and digitally literate—an area still deficient in many schools (Oyelekan & Agagu, 2020). Infrastructure constraints, including unreliable electricity and poor internet access, remain significant obstacles, particularly in rural regions (NCC, 2022; UNICEF, 2023). The presence of enabling policies like the ICT in Education Policy (2019) and the Revised National Policy on Education (2013) is crucial for sustainable implementation (NERDC, 2021). Socio-economic disparities also influence access to AI tools, risking the deepening of existing inequalities without public support. Cultural acceptance is another key factor; local communities must perceive AI as a relatable, beneficial innovation rather than a foreign imposition. In essence, the framework highlights AI as a powerful, synergistic driver of inclusion not in isolation but when reinforced by policy, infrastructure, capacity building, and cultural relevance to expand equitable learning opportunities for all, particularly the marginalized. The Conceptual Logic Model for Leveraging AI for Inclusive Education in Nigeria illustrates a flow of interconnected components designed to drive equity and access in education and comprises the following layers:

Table 1: Logic Model for Leveraging AI for Inclusive Education in Nigeria

Components	Description
↓ **Inputs**	- Government policy support (e.g., Nigeria Digital Economy Policy) - Investment in AI tools and assistive technologies - Teacher training programs - Partnerships with EdTech companies and NGOs - Reliable ICT infrastructure development
↓ **Activities**	- Development and deployment of AI-powered educational tools - Training educators in the use of AI and assistive technologies - Designing AI tools to support multiple Nigerian languages and disabilities - Integrating UDL principles in content creation
↓ **Outputs**	- AI-assisted learning platforms tailored for diverse learners - Availability of assistive tools in classrooms - Educators with digital competence - Increased access to learning materials via AI platforms
↓ **Short-Term Outcomes**	- Increased teacher capacity to use inclusive digital tools - Enhanced learner engagement and participation - Greater access for students with disabilities and marginalized communities
↓ **Long-Term Outcomes**	- Reduced educational inequality - Improved retention and academic performance for diverse learners - Mainstreaming inclusive education practices in Nigeria - Achievement of SDG 4: Quality Education for All

As shown in Table 1 in the conceptual logic model for leveraging AI for inclusive education in Nigeria, to effectively integrate Artificial Intelligence into Nigeria's educational system for inclusive outcomes, several foundational inputs are required. These include supportive government policies such as the Nigeria Digital Economy Policy, sustained investments in AI-driven tools and assistive technologies, comprehensive teacher training programs, partnerships with Educational Technology companies and non-governmental organizations, and the establishment of reliable ICT infrastructure. Based on these inputs, core activities would involve the development and deployment of AI-powered educational platforms, the training of educators to use inclusive AI technologies, the creation of AI tools that support Nigeria's diverse languages and disabilities, and the integration of Universal Design for Learning (UDL) principles into digital content development. These activities are expected to yield tangible outputs such as the availability of AI-assisted learning platforms tailored to diverse learner needs, widespread access to assistive tools in

classrooms, a digitally competent teaching workforce, and increased access to learning materials through AI-enhanced systems.

In the short term, these outputs would lead to increased teacher capacity for inclusive teaching, enhanced learner engagement and participation, and improved access to quality education for students with disabilities and marginalized groups. Over the long term, these efforts will contribute to a reduction in educational inequality, better learning outcomes and retention rates, the mainstreaming of inclusive education practices across Nigeria, and meaningful progress toward the realization of Sustainable Development Goal 4 - ensuring inclusive and equitable quality education for all.

Derivable Educational Outcomes for the Inclusiveness of the Framework into Nigerian Educational System

The derivable educational outcomes from the inclusiveness of the AI-based framework into the Nigerian educational system, will facilitates the framework's provisions and context for:

1. Improved Access to Quality Education for Marginalized Learners: AI-driven assistive technologies like screen readers and braille converters enable learners with disabilities to access curriculum content effectively (World Bank, 2020). Similarly, mobile-friendly, low-bandwidth applications ensure inclusion of learners in rural and underserved areas (Yusuf & Onasanya, 2021). These initiatives align with Nigeria's national policy of inclusive education and the goal of leaving no learner behind (UNICEF, 2021; Adebayo, 2022).
2. Personalized Support for Diverse Learning Needs: The framework leverages AI personalization engines to deliver individualized learning paths for underperforming, over-age, and accelerated learners, thereby enhancing academic outcomes and improving retention across diverse educational backgrounds (Akinsolu & Oke, 2022).
3. Alternative Learning Channels in Resource-Constrained Environments: AI-powered virtual tutors and chatbots will help address teacher shortages by supplementing classroom instruction (UBEC, 2020). Offline-capable tools and solar-powered devices ensure learning continuity in off-grid, underserved areas (Adu et al., 2021), while automated assessments ease teacher workload and enhance learner engagement (Ngugi, 2022).

4. Strengthened Teacher Competence for Inclusive and Digital Pedagogy: Real-time analytics dashboards and AI-driven professional development platforms will enhance teachers' skills and instructional strategies (Oyelekan & Agagu, 2020; Okonkwo, 2021). This equips them to deliver adaptive, inclusive lessons tailored to individual learner needs, thereby improving overall pedagogical effectiveness (Adedoyin & Soykan, 2020).
5. Greater Linguistic and Cultural Inclusivity in Learning: AI-powered voice-to-text and translation technologies will enable the integration of indigenous languages into learning delivery (Adewumi & Olatunji, 2021). This, combined with culturally relevant and context-sensitive content, will enhance comprehension, reinforce learner identity, and promote community acceptance of digital learning platforms (Ajayi, 2020).
6. Narrowing the Digital Divide through Accessible Technology: By prioritizing mobile-first, low-data, and offline-compatible AI applications, the framework ensures inclusive access for learners in low-income and rural communities (Olaniyi et al., 2021; Oyedemi & Salawu, 2023). This approach democratizes digital learning, providing equal opportunities for all learners to benefit from technology.
7. Data-Driven Inclusion and Responsive Policy Implementation: AI-enabled analytics will identify at-risk learners and predict learning challenges in real time (UNESCO, 2020), while disaggregated data on performance and participation will inform evidence-based planning, equitable resource allocation, and targeted educational interventions (NERDC, 2021; Okebukola, 2020; Nwagwu, 2021).

These outcomes collectively will establish a systemic transformation that aligns with Nigeria's National Policy on Education (2013), the ICT in Education Policy (2019), and SDG 4 goals of inclusive and equitable quality education for all. The framework doesn't merely provide technological solutions but reimagines the architecture of inclusion through AI-enhanced equity, access, and personalization in education.

Conclusion

This study proposed a conceptual framework for integrating Artificial Intelligence (AI) into Nigeria's education system to promote inclusive education. It identifies AI as a transformative tool that can enhance access,

equity, and quality for diverse learner populations—particularly those with disabilities, in rural areas, and from low socio-economic backgrounds. The framework highlights three mediating pathways through which AI fosters inclusivity: assistive technologies, personalized learning tools, and accessibility innovations. These AI-driven solutions support learners with special needs, adapt instruction to individual abilities, and overcome linguistic, infrastructural, and connectivity barriers. However, the effectiveness of AI integration is influenced by key moderating factors: teacher digital competence, infrastructural readiness, policy support, socio-economic disparities, and cultural acceptance. These contextual realities must be addressed to ensure the sustainability and equity of AI implementation. A logic model was developed to outline the inputs (policy support, infrastructure, training), activities (tool development, capacity building), and outcomes (enhanced access, improved retention, reduced inequality). Ultimately, the framework supports the achievement of SDG 4—ensuring inclusive and equitable quality education for all. In conclusion, AI offers significant potential to transform Nigeria's education system by bridging access gaps and enabling inclusive learning. Realizing this potential requires coordinated investments in infrastructure, teacher training, localized content development, and policy alignment. By adopting this framework, Nigeria can take critical steps toward an education system that is adaptive, inclusive, and future-ready.

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Addressing Graduate Employability Through 21st Century Digital Skills in Ijebu-Ode Local Government Area

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Abstract

This study evaluated the impact of targeted digital skills training on graduate employability through the acquisition of 21st-century digital competencies in Ijebu-Ode Local Government Area, Ogun State, Nigeria. Using a mixed-methods design, 20 graduates participated in an intensive training programme comprising four modules: Google Workspace, LinkedIn Professional Development, Canva Creative Design, and CV Writing with digital tools. Quantitative data were gathered through pre- and post-test assessments, while qualitative insights were obtained via Focus Group Discussions (FGDs). Results revealed substantial improvements across all modules: Google Workspace ($t(19) = -18.96$, $p < .001$, $d = 4.24$), LinkedIn Professional Development ($t(19) = -21.96$, $p < .001$, $d = 4.91$), Canva Creative Design ($t(19) = -12.87$, $p < .001$, $d = 2.88$), and CV Writing ($t(19) = -16.10$, $p < .001$, $d = 3.60$). Effect sizes ranging from 2.88 to 4.91 indicated exceptionally large practical gains in digital proficiency and employability skills. Thematic analysis of qualitative data highlighted three dominant themes: high participant satisfaction, enhanced employability prospects, and strong transferability of skills to real-world contexts. Graduates reported increased confidence in professional networking, creative content production, collaborative digital work, and competitive CV presentation. Beyond technical competence, participants developed critical soft skills such as adaptability and problem-solving. The findings demonstrate that structured, context-specific digital skills training significantly enhances graduate employability, bridges the digital skills gap, and equips participants with relevant competencies for the modern workforce. The study recommends embedding such programmes into graduate development initiatives to foster career readiness, competitiveness, and resilience in Nigeria's rapidly evolving digital economy.

Keywords: Graduate employability, digital skills training, 21st-century competencies, Google Workspace, LinkedIn, Canva, CV writing

Introduction

Graduate unemployment remains one of the most pressing socio-economic challenges in Nigeria, despite the rapid expansion of tertiary education over the past two decades. The widening disconnect between academic qualifications and the evolving demands of the labour market has rendered a significant proportion of graduates unemployable, exacerbating national insecurity, economic stagnation, and youth disillusionment (Owolabi & Adeosun, 2023). The National Bureau of Statistics (NBS, 2023) reports that youth unemployment in Nigeria exceeds 42.5%, with university graduates forming a substantial share of this unemployed population. A major driver of this crisis is the widespread deficiency in 21st-century digital skills competencies that have become indispensable for navigating modern, technology-driven workplaces (Adewale & Afolabi, 2019; Bridgstock, 2019). Digital skills encompassing productivity tools, communication platforms, content creation, and personal branding are now fundamental to employability and career progression in both formal and informal sectors (Bridgstock, 2019). However, systemic constraints such as outdated university curricula, inadequate ICT infrastructure, and chronic underfunding in Nigerian higher education have hindered the integration of these skills into mainstream academic training (Ogunleye & Adebayo, 2020). Consequently, graduates often enter the labour market ill-prepared for the realities of the digital economy, limiting their ability to secure and sustain meaningful employment. While initiatives such as the N-Power programme and the Digital Nigeria initiative have sought to close this gap, they have been undermined by inconsistent implementation, limited reach, and insufficient empirical evaluation (UNESCO, 2021). Scholarly literature on practical, measurable digital skills interventions in Nigeria remains sparse, with most studies adopting conceptual or descriptive approaches (Salami, 2021). This paucity of evidence underscores the need for rigorous, data-driven research to assess how targeted digital skills training can enhance graduate employability in real-world contexts.

Statement of the Problem

The primary aim of tertiary institutions globally, and in Nigeria specifically, is to produce skilled graduates capable of contributing to national development and meeting evolving manpower needs. However, graduate unemployment in Nigeria has persisted at alarming levels for over a decade, worsening annually

(Emeh & Eze, 2022). Each year, thousands graduate, yet many remain excluded from the labour market—not necessarily due to a lack of jobs, but because they lack the 21st-century digital competencies employers demand (Ajayi & Adebayo, 2021; Bawuro et al., 2019). This skills deficit has serious consequences. Many graduates, frustrated by prolonged unemployment, face declining morale and resort to underemployment, precarious informal work, or even criminal activities such as cybercrime and armed robbery, thereby exacerbating insecurity and diverting national resources from socio-economic development. While universities and stakeholders have introduced computer studies, entrepreneurship courses, and computer appreciation programmes, these interventions are often fragmented, outdated, and poorly aligned with modern digital labour market needs. Core employability skills such as Google Workspace productivity tools, Canva for design, LinkedIn networking, and professional CV writing remain underemphasised in curricula (Salami, 2021; Olaore, 2019).

Previous research on graduate employability in Nigeria has mainly focused on broad skill gaps or sector-specific needs (Adebakin & Ajadi, 2020; Udoh & Akpan, 2021), with few studies assessing targeted digital skills training using empirical pre- and post-intervention data. Although global frameworks like the European Commission's DigComp 2.2 highlight that digital competence extends beyond technical skills to include adaptability, creativity, and collaboration (Vuorikari et al., 2022), Nigeria's higher education system has yet to institutionalise such comprehensive models (Eze et al., 2021). This study evaluated the impact of four targeted digital skill domains - Google Workspace, LinkedIn, Canva, and CV writing on unemployed graduates in Ijebu-Ode, Ogun State, using a quasi-experimental design with measurable pre- and post-training assessments.

Research Objectives

The evaluated the impact of a targeted 21st-century digital skills training program comprising Google Workspace, LinkedIn Professional Development, Canva Creative Design, and CV Writing on the employability readiness of unemployed graduates in Ijebu-Ode, Ogun State, Nigeria. Specifically, the study:

1. To determine the mean difference in pre-and-posttest scores of participants learned Google Workspace

2. To evaluate the mean difference in pre- and post-test scores of participants learned LinkedIn professional
3. To assess the mean difference in pre- and post-test scores of participants learned Canva Creative digital design.
4. To assess the mean difference in pre- and post-test scores of participants learned CV writing.

Research Hypotheses

The following research hypotheses were tested at 0.05 level of significance.

$H_0$1: There is no significant mean difference in pre and post-test mean scores of participants learned Google workspace.

H02: There is no significant mean difference in pre- and post-test mean scores of participants learned LinkedIn professional.

$H_0$3: There is no significant difference in pre and post-test mean scores of participants learned Canva digital design.

$H_0$4: There is no significant difference in pre and post- test mean scores of participants learned Digital CV Writing.

Methodology

This study adopted a mixed-methods pre-test–post-test design to evaluate the impact of targeted digital skills training on graduate employability through 21st-century digital competencies in Ijebu-Ode Local Government Area, Ogun State, Nigeria. The study utilized a one-group pre-test–post-test experimental design, which measured changes in participants' competencies before and after the intervention. The qualitative component used Focus Group Discussions (FGDs) to collect participants' reflections on the training's relevance, satisfaction, and employability benefits. This integration allowed for statistical measurement of skill gains and rich contextual understanding of participants' experiences.

The target population consisted of unemployed and underemployed graduates in Ijebu-Ode LGA. Twenty (20) participants were randomly selected based on the following criteria: possession of a recognized higher education qualification (OND, HND, B.Sc., or equivalent), commitment to complete all

modules of the training and demonstrated limited or intermediate proficiency in the targeted digital skills prior to the intervention. The training programme was divided into four intensive modules, delivered in hands-on, interactive sessions on Google Workspace, LinkedIn Professional Development, Canva Creative Design and CV Writing with Digital Tools.

The study employed a Focus Group Discussion (FGD) guide as its primary qualitative instrument to gather in-depth insights on participants' experiences with the digital skills training. The guide contained open-ended questions addressing the relevance of the modules, ease of learning, confidence in skill application, and perceived impact on employability. It was validated by experts to ensure clarity, cultural appropriateness, and alignment with the study's objectives. Discussions were audio-recorded and transcribed verbatim, allowing for accurate thematic analysis. This instrument was instrumental in revealing key themes such as high satisfaction, improved employability prospects, and strong transferability of skills, thus complementing the quantitative findings with rich contextual understanding.

Qualitative and thematic analyses were primarily employed to interpret non-numerical data from focus group discussions (FGDs) and open-ended questionnaire responses. A Paired sample t-tests compared pre- and post-test means for each module at $p < .05$**.** The training programme was divided into four intensive modules, delivered in hands-on, interactive sessions: Google Workspace, LinkedIn Professional Development, Canva Creative Design, and CV Writing on the employability readiness of unemployed graduates in Ijebu-Ode Local Government Area, Ogun State, Nigeria.

Results

Hypotheses Testing

$H_0$1: There is no significant mean difference in pre and post-test mean scores of participants learned Google workspace.

Table 1: Paired Sample t-Test Results for Pre- and Post-Test Scores in Google Workspace Training

Training Module	N	Pre-Test Mean (SD)	Post-Test Mean (SD)	t(df)	p-value	Cohen 's d	Effect Size Magnitude
Google Workspace	20	2.44 (0.37)	3.95 (0.62)	-18.96 (19)	< .001	4.24	Exceptionally Large

In Table 1, the Google Workspace training produced a substantial improvement in participants' scores, moving from a modest pre-test performance (M = 2.44) to a notably higher post-test mean (M = 3.95). The paired sample t-test result, $t(19) = -18.96$, $p < .001$, confirms that this improvement was statistically significant. The Cohen's d of 4.24 reflects an exceptionally large effect size, indicating that the training had a profound positive impact. This suggests the integration of instructor-led demonstrations, group collaboration, and hands-on exercises in the Google Workspace module was highly effective in building digital productivity competencies relevant to workplace applications.

H02: There is no significant mean difference in pre- and post-test mean scores of participants learned LinkedIn professional.

Table 2: Paired Sample t-Test Results for Pre- and Post-Test Scores in LinkedIn Professional Development Training

Training Module	N	Pre-Test Mean (SD)	Post-Test Mean (SD)	t(df)	p-value	Cohen's d	Effect Size Magnitude
LinkedIn Professional Development	20	2.61 (0.27)	3.99 (0.39)	-21.96 (19)	< .001	4.91	Exceptionally Large

In Table 2, the LinkedIn Professional Development module yielded the strongest performance gain among all the modules, with participants improving from a pre-test mean of 2.61 to a post-test mean of 3.99. The result, $t(19) = -21.96$, $p < .001$, demonstrates that the increase was highly significant. The effect size (Cohen's $d = 4.91$) is not only exceptionally large but also the largest observed in the study, suggesting this training substantially enhanced participants' professional branding, networking skills, and digital employability readiness. The outcome highlights the value of contextual, practice-based training in leveraging LinkedIn for career advancement.

$H_0$3: There is no significant difference in pre and post-test mean scores of participants learned Canva digital design.

Table 3: Paired Sample t-Test Results for Pre- and Post-Test Scores in Canva Creative Design Training

Training Module	N	Pre-Test Mean (SD)	Post-Test Mean (SD)	t(df)	p-value	Cohen's d	Effect Size Magnitude
Canva Creative Design	20	2.78 (0.40)	3.93 (0.08)	-12.87 (19)	< .001	2.88	Very Large

In Table 3, the Canva Creative Design training significantly improved participants' creative digital design proficiency, with mean scores rising from 2.78 to 3.93. The paired sample t-test yielded $t(19) = -12.87$, $p < .001$, confirming a statistically significant difference. The effect size (Cohen's $d = 2.88$) was very large, indicating a strong practical impact. These results underscore that engaging learners in design projects contextualized to real-world employability—such as marketing collateral, resumes, and branding materials—can produce remarkable skill gains in a short training period.

$H_0$4: There is no significant difference in pre and post- test mean scores of participants learned Digital CV Writing.

Table 4: Paired Sample t-Test Results for Pre- and Post-Test Scores in Digital CV Writing Training

Training Module	N	Pre-Test Mean (SD)	Post-Test Mean (SD)	t(df)	p-value	Cohen's d	Effect Size Magnitude
CV Writing with Digital Tools	20	2.61 (0.38)	3.95 (0.12)	-16.10 (19)	< .001	3.60	Exceptionally Large

In Table 4, the Digital CV Writing module significantly boosted participants' abilities to craft professional, tech-enhanced resumes, improving from a mean of 2.61 to 3.95. The statistical analysis, $t(19) = -16.10$, $p < .001$, shows that the gain was highly significant. Cohen's d of 3.60 indicates an exceptionally large effect size, signifying a major leap in competency. The success of this module can be attributed to the blend of direct instructor feedback, peer review, and practical application within a real-world employability context.

Thematic Analysis

The thematic analysis of the focus group discussions (FGDs), supported by the analysed and interpreted quantitative data, revealed three prominent and interrelated themes: training satisfaction and learning engagement, perceived employability enhancement and skill transferability and real-world application. With respect to training satisfaction and learning engagement, participants expressed a high level of satisfaction with the training, describing it as both practical and well-structured, with clear guidance that facilitated learning and engagement. This perception was reinforced by the statistically significant improvements recorded across all modules. For instance, Google Workspace training produced a remarkable increase in participants' mean scores from 2.44 (SD = 0.37) to 3.95 (SD = 0.62), $t(19) = –18.96$, $p < .001$,

with an exceptionally large effect size (Cohen's $d = 4.24$), indicating that the training was both impactful and well-received.

Also, vis-à-vis the perceived employability enhancement, the sessions were perceived to have substantial employability benefits. Participants reported increased confidence in applying for jobs, enhanced capacity for professional networking, and greater ability to showcase their competencies effectively. This aligns with the LinkedIn Professional Development results, where mean scores rose from 2.61 (SD = 0.27) to 3.99 (SD = 0.39), $t(19) = -21.96$, $p < .001$, yielding the largest observed effect size (Cohen's $d = 4.91$). Such quantitative gains underscore the qualitative feedback that the training significantly strengthened participants' online presence and personal branding.

Subsequently, on skill transferability and real-world application, the training promoted strong skill transferability, with participants noting that the digital competencies acquired could be readily adapted to a range of workplace tasks and entrepreneurial activities. This was particularly evident in the Canva Creative Design module, where mean scores improved from 2.78 (SD = 0.40) to 3.93 (SD = 0.08), $t(19) = -12.87$, $p < .001$, with a very large effect size (Cohen's $d = 2.88$), and in the CV Writing with Digital Tools module, which increased from 2.61 (SD = 0.38) to 3.95 (SD = 0.12), $t(19) = -16.10$, $p < .001$, $d = 3.60$. These substantial statistical improvements mirror participants' narratives about applying learned skills to diverse real-world professional and entrepreneurial contexts, making the training both relevant and adaptable.

The modules on Google Workspace, LinkedIn Professional Development, Canva Creative Design, and CV Writing on the employability readiness of unemployed graduates combined instructor-led demonstrations, collaborative group work, and individual practice exercises contextualized to real-world employability scenarios. Across all modules, delivery methods combined instructor-led demonstrations, collaborative group work, and individual practice exercises, ensuring that learning was both participatory and contextualized to real-world employability scenarios. This approach not only strengthened technical competence but also improved participants' confidence in applying these skills within professional and entrepreneurial environments. Also, all the four modules demonstrated statistically significant improvements in digital skills with large to exceptionally large effect sizes. Among them, LinkedIn Professional Development produced the highest effect size, highlighting the centrality of professional networking in employability

strategies. The results suggest that a blended training approach, combining productivity tools, professional branding, creative design, and digital CV writing, can holistically prepare graduates for competitive job markets. The findings clearly indicate that the digital skills training was highly effective, yielding both statistically significant improvements and strong positive perceptions among participants. The high satisfaction levels, notable gains in employability competencies, and strong skill transferability suggest that the training not only enhanced participants' immediate digital productivity but also equipped them with versatile competencies applicable to diverse employment and entrepreneurial contexts. This demonstrates the programme's potential as a practical intervention for improving the job readiness of unemployed graduates.

Discussion

The results of this study demonstrate that targeted, hands-on digital skills training can significantly enhance graduate employability by equipping participants with practical 21st-century competencies. Across all four modules—Google Workspace, LinkedIn Professional Development, Canva Creative Design, and CV Writing with Digital Tools participants recorded statistically significant improvements, with all p-values well below .001. More importantly, the magnitude of improvement, as indicated by effect sizes ranging from 2.88 to 4.91, far exceeded the threshold for a "large" effect according to Cohen's (1988) guidelines, confirming that the changes were not only statistically significant but also transformational in practice.

The Google Workspace module recorded an exceptionally large effect size (d = 4.24), underscoring the importance of proficiency in productivity tools for collaborative work, document management, and remote teamwork skills increasingly demanded in the digital economy. This finding aligns with studies such as Ajadi and Salawu (2020), which found that mastery of productivity software is a strong predictor of workplace efficiency and employability. The LinkedIn Professional Development module yielded the largest effect size (d = 4.91), showing that professional networking, personal branding, and online career positioning are critical employability skills. This mirrors findings by Bennett et al. (2021), who highlighted that active LinkedIn engagement can improve job search success and enhance career mobility. Participants in this study reported increased confidence in approaching recruiters, joining industry

groups, and showcasing achievements - -practical outcomes that extend beyond technical skill acquisition to professional self-marketing.

The Canva Creative Design module also recorded a very large effect (d = 2.88), highlighting the rising demand for digital creativity and visual communication skills across industries. As supported by Olanrewaju (2022), digital design competence is increasingly valued in both formal employment and entrepreneurial ventures, enabling graduates to produce marketable content for business promotion and communication. The CV Writing with Digital Tools module produced a substantial effect size (d = 3.60), reinforcing the idea that employability is partly determined by how effectively graduates present their qualifications and skills to potential employers. This supports the work of Popoola and Adekeye (2021), who emphasized that CV quality strongly influences shortlisting decisions in competitive job markets. Participants' improved ability to craft industry-standard CVs using digital templates and formatting tools suggests enhanced readiness for job applications.

Qualitative findings corroborated the statistical outcomes. Participants reported high satisfaction with the programme, noting that the training was practical, relevant, and immediately applicable. They also highlighted improved confidence in seeking jobs, networking online, and using digital tools in workplace scenarios. A recurring theme was skill transferability**,** with participants affirming that the skills learned could be applied in both employment and entrepreneurial contexts, thereby widening their career opportunities. Collectively, these findings indicate that structured, contextually relevant digital skills training is a viable strategy for addressing the employability gap among graduates in Ijebu-Ode LGA, with potential for replication in other localities facing similar challenges.

Conclusion

This study evaluated the transformative effect of a targeted digital skills programme spanning Google Workspace, LinkedIn professional networking, Canva creative design, and CV writing on the employability and workplace readiness of unemployed graduates. The training was designed not merely to impart technical competence, but to cultivate transferable capabilities that are relevant to evolving demands of the labour market. Quantitative results demonstrated marked improvements in productivity, collaboration,

professional visibility, creative output, and CV competitiveness. Qualitative insights reinforced these findings, revealing heightened confidence, adaptability, and problem-solving capacity among participants, alongside the seamless application of newly acquired skills in both workplace and entrepreneurial contexts. Collectively, these outcomes underscore the strategic value of integrating context-specific digital training into graduate development initiatives. By bridging technical proficiency with essential soft skills, the programme offers a scalable, adaptable model capable of aligning higher education outcomes with the realities of an increasingly digitized and competitive labour market—particularly within economies grappling with high graduate unemployment.

Recommendations

Based on the findings, the following recommendations are proposed:

1. Nigerian tertiary institutions (Universities, Polytechnics, Monotechnics and Colleges of Education) should embed modules on productivity tools, professional networking, creative design, and CV optimization into undergraduate curricula, ensuring graduates acquire job-ready skills before entering the labour market.

2. Government agencies, higher institutions, and private sector actors, especially technology companies and firms should collaborate to co-design and deliver scalable digital training programmes that reflect evolving workplace requirements.

3. Beyond technical proficiency, training should deliberately be organized to foster transferable competencies such as problem-solving, adaptability, and professional communication to tertiary institutions students to amplify employability outcomes.

4. Graduates should have access to structured follow-up platforms such as LinkedIn groups or alumni hubs that provide peer learning, mentorship, and ongoing exposure to labour market opportunities.

5. Given the demonstrated transferability of skills to business ventures, digital skills initiatives should incorporate modules on how to leverage these tools for entrepreneurship, digital marketing,

and brand building before student graduate from tertiary institutions.

6. Programmes in individual higher institutions in Nigeria should adopt data-driven monitoring systems that measure long-term employability impact, skill retention, and adaptability to industry shifts, ensuring training remains relevant and effective.

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Effect of Context–Based Instructional Approach on Academic Performance in Biology among Secondary School Students in Gombe Metropolis, Gombe State, Nigeria

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Abstract

This study investigated the effect of Context-Based Approach on Students' Academic Performance in Biology among Senior Secondary School Two Students in Gombe metropolis, Gombe State, Nigeria. Four research questions and Six null hypotheses were formulated and tested in the study. The design of the study was quasi experimental of pretest- posttest and control groups. One hundred and forty (140) students were selected from two schools and the students were assigned to experimental and control groups from a population of 24,526 students in 19 schools. The groups were exposed to lesson treatment of six weeks. The experimental group was taught using Context-Based Instructional Approach while the control group was taught using conventional method on same Biology contents of Respiratory system. The instruments were validated by three experts and reliability coefficient obtained was 0.72. Descriptive statistics of mean and standard deviation were used to answer research questions while inferential statistic of ANCOVA was used to test the hypotheses at 0.05 level of significance. The results of the study showed significant difference in mean performance scores of students taught Biology concepts using context-based approach over students taught same biology concepts using conventional method. No significant effect of the treatment and gender on student's academic performance difference while a significant interactive effect was shown between treatment and group on retention with ($p=0.00 <0.05$) with 97.8% of the variance in retention. based on the findings of this study some recommendations were offered among others; Context-Based Instructional Approach to teaching Biology be used in teaching respiration adopted at all levels of Biology education because it enhances academic performance. Context-Based Instructional Approach can help Biology teachers to disseminate knowledge to the best of their ability by making use of all available resources rather than resorting to the use of conventional method.

***Keywords**: Context based, Achievement, Respiratory system*

Introduction

Education is widely regarded as one of the key tools for individual and societal development (Adeosun, 2021). In today's rapidly evolving, science driven world, biology holds a prominent place among the sciences because it deepens our understanding of the natural world and various life processes (Osborne & Dillon, 2021). Its relevance spans multiple sectors, including agriculture, medicine, pharmacy, and industry, with applications ranging from plant breeding for improved food production to processes like brewing, bread making, and milk processing (Joda & Abel, 2017; Ibe, 2019). Furthermore, biology opens career opportunities in diverse fields such as food technology, medicine, and veterinary science.

Despite its importance, academic performance in biology at the senior secondary school level in Nigeria has been below expectations, with the problem equally prevalent in Gombe Metropolis. According to the West African Examinations Council (WAEC), only 57.2% of candidates nationwide obtained credit and above in biology in 2023, and this declined to 54.6% in 2024 (WAEC, 2024). In Gombe Metropolis, the trend mirrors the national pattern, with failure rates in biology consistently higher than in other science subjects (Gombe State Ministry of Education, 2024). This persistent underachievement has raised concerns among educators, parents, and policymakers.

The traditional lecture method commonly used in Nigeria has been criticised for being overly teacher-centred, promoting rote memorisation, and presenting abstract concepts with little connection to students' everyday lives (Gilbert, 2018; Fensham, 2019). These limitations often result in low student interest and poor understanding of topics such as respiration, cell division, photosynthesis, and ecology, which have been identified as challenging for learners (Mumini, Dike, & Nwogwu, 2017; Kilic, Taber, & Winter, 2021).

To address these challenges, researchers have increasingly advocated for context-based instructional approaches (Bennett, Lubben, & Hogarth, 2019; Okeke & Nwafor, 2021). This method connects scientific concepts to real-life situations, making learning more relevant, engaging, and meaningful. By emphasising practical applications and everyday contexts,

Context-based approach has emerged as an alternative that aims to address these challenges by linking scientific concepts to real-life experiences (Okeke

and Nwafor, 2021). This approach emphasizes the application of biological knowledge to everyday contexts, making learning more relevant, engaging, and meaningful for students (Bennett *et al.,* 2021). By doing so, the context-based approach seeks to improve both academic performance and retention of biological knowledge (Gilbert, 2018). Research shows that students are more likely to engage with the material when they see its relevance to their personal and social environments (Fensham, 2019). This approach has been successfully implemented in several countries and has shown significant improvements in students' understanding, interest, and retention of scientific concepts (Bennett *et al.,* 2021).

Biology, as a core science subject, requires the application of science process skills to bring about meaningful learning (Michael, 2021). However, its inherently abstract nature means that effective teaching demands strategies that make concepts concrete and relatable (Taştan et al., 2021). The context-based approach bridges the gap between theory and application by linking biology content to students' immediate realities, thereby promoting deeper understanding and long-term retention.

Statement of the Problem

Despite its importance, academic performance in biology at the senior secondary school level in Nigeria has been below expectations, with the problem equally prevalent in Gombe Metropolis. According to the West African Examinations Council (WAEC), only 57.2% of candidates nationwide obtained credit and above in biology in 2023, and this declined to 54.6% in 2024 (WAEC, 2024). In Gombe Metropolis, the trend mirrors the national pattern, with failure rates in biology consistently higher than in other science subjects (Gombe State Ministry of Education, 2024). This persistent underachievement has raised concerns among educators, parents, and policymakers. The persistent decline in students' performance in Biology within Gombe Metropolis has become a major educational concern. Data from the West African Examinations Council (WAEC) indicate that a significant proportion of students fail to meet the expected performance standards in Biology, and this trend has shown little improvement over time. Beyond poor examination results, another critical challenge is students' inability to retain key biological concepts over extended periods.

Research Objectives

The objectives of the research are to determine:

1. The effect of context–based approach on students' academic performance in biology in senior secondary schools in Gombe metropolis.

2. The gender differences in students' academic performance when taught biology using context-based approach.

3. To determine the interaction effect of treatment and gender on academic performance

Research Questions

The research questions for this study are as follows:

1. What is the effect of Context-Based Approach on students' academic performance in Biology among Secondary School Students in Gombe state?

2. What are the gender differences on students' academic performance when taught biology using context-based approach?

3. What is the interaction effect of treatment and gender on academic performance

Research Hypotheses

The null hypotheses for this study are stated as follows:

H_{O1}**:** There is no significant difference between the academic performance of SS2 Biology students taught Biology concepts using context-based approach and those taught same concepts using conventional method.

H_{O2}**:** There is no significant gender difference in students' mean academic performance when taught biology using context-based approach.

H_{O3}**:** To determine the interaction effect of treatment and gender on academic performance

Methodology

Research design for this study is quasi- experimental design (Pre-test/post-test). Two groups of students were used for data collection (experimental group (EG) and control group (CG)). The two groups were pretested to determine their equivalence in ability before the commencement of treatment. The experimental group was taught biology concept using context-based approach and the control group was taught biology concept using conventional method. The diagrammatic illustration of the design is as follows:

$$EG \longrightarrow O_1 \longrightarrow X_1 \longrightarrow O_2$$

$$CG \longrightarrow O_1 \longrightarrow X_2 \longrightarrow O_2$$

Figure 1: Research Design Illustration for the study.

The population for this study comprised all science secondary school students in Gombe metropolis. The number of science secondary schools within Gombe metropolis are 19 with 24,526 students which consists 14,612 males and 9,914 females. SS two biology students were selected in this study. Table 1 shows the names of science secondary schools in Gombe metropolis and their students' enrolment.

Table 1: Population of the Study

S/N	Schools	Male	Female	Total Population
1	GAC Gombe II	367	284	660
2	GAC Gombe I	538	320	858
3	GCDSS Ahmadu Gombe	371	192	563
4	GCDSS Gombe	889	391	1,280
5	GDSS Bolari East	807	567	1,374
6	GDSS Gandu	1,216	974	2,190
7	GDSS Herwagana	1,237	615	1,852
8	GDSS Jalo Waziri	541	360	901
9	GDSS Nasarawo	495	270	765
10	GDSS Orji Estate	350	291	641
11	GDSS Pantami	1,225	938	2,163
12	GDSS Pilot Gombe	1,261	860	2,121
13	GDSS Shehu Abubakar	355	273	628
14	GCDSS Gabukka	944	901	1,845
15	GSS Gombe I	892	0	892
16	GDSSS (Science II) Gombe	1,128	1,005	2,133
17	Hassan Cent. Sen. Sec. School	1,035	1,049	2,084
18	Special Educ. Center Gombe	102	40	142
19	GSTC Gombe	850	584	1,434
TOTAL		14,612	9,914	24,526

Source: ASC 2020/2021, EMIS, MoE Gombe state.

Two (2) schools were selected out of the 19 secondary schools in Gombe metropolis, the schools selected are namely; GDSSS (Science II) Gombe as experimental and Hassan central senior secondary school as control sample, in each of the schools' SS II Intact class were used for the study. A total of 140 students, 78 experimental group and 62 control group. There are 36 males and 42 females in the sampled schools.

Table 2: Sample of the Study

S/N	School Code	Group	Status	Number of Students
1	GDSSS II	Experimental	Mixed	78
2	Hassan Central	Control	Mixed	62
			Total	140

Purposive sampling technique was used in selecting two schools from the population. The intact classes from the ample schools were assigned into experimental groups and the other school for control group of the intact class in each school, the experimental group was taught using Context-based instructional approach while control group was taught with conventional method.

The Instrument for data collection in this research was Biology Performance Test (BPT) which contains fifty (50) structured multiple choice items with one correct answer and three distracters adapted from SSCE past questions. The items in the test covered the topic taught so as to generate information

The content of the instrument was validated by three (3) experts, from Gombe State University. after some modifications, suggestion and criticism to access content and face validity. The experts made corrections, after validation, no item was discarded, this is because all items were standard as adapted from past SSSCE questions. From the pilot testing result, the reliability coefficient in the Biology Performance Test (BPT) was found to be 0.72. The value was obtained using test re-test method by application of Pearson Product Momentum Correlation (PPMC) statistic. Thus, the instrument was considered reliable and was used for data collection.

The researcher collected introductory letter from the department of science education, Gombe State University and took it to the principals of the schools under study. Data for the study was collected through pre-test, post-test and retention test. On the first day of the visit, pre-test was administered to all the

groups in order to determine their equivalence with the help of research assistants which are biology teachers from various schools under study. Two assigned group were exposed to lesson (treatment) for six weeks using seventy minutes from their timetable. Descriptive statistics were used to calculate mean and standard deviation to answer the research questions and inferential statistics were used to test the six (6) null hypotheses formulated for this study using ANCOVA at 0.05 level of significance.

Results

Research Question One: What is the effect of Context-Based Approach on student's academic performance in Biology among senior secondary students in Gombe metropolis?

Table 3: Mean and Standard Deviation of the Experimental and Control Groups in Biology Performance Test

Groups	N	Mean Score		Standard Deviation	Mean Difference
		Pretest	Posttest		
EG	78	9.56	26.77	4.51	14.34
CG	62	9.04	12.43	3.21	
TOTAL	140				

Table 3 presents the mean performance scores of the experimental and control groups in the Biology Performance Test. The pretest results indicate that both groups started at a comparable level (EG = 9.56; CG = 9.04), suggesting no significant difference in prior knowledge before the treatment. However, after the intervention, there was a noticeable increase in the posttest scores. The experimental group, taught using the context-based instructional approach, had a posttest mean score of 26.77, while the control group, taught using the conventional method, had a mean score of 12.43. This results in a mean difference of 14.34 in favour of the experimental group. This is an indication that the experimental group, taught using the context-based instructional approach perform better than the control group, taught using the conventional method.

Research Question Three: What are the gender differences on students' academic performance when taught biology using context-based approach?

Table 4: Mean and Standard Deviation of Male and Female Students in the Experimental Group on Biology Performance Test

EG	n	Mean Score	SD	Mean Difference
Male students	36	27.01	4.03	1.10
Female students	42	25.91	4.42	
Total	**78**			

Table 4 revealed that gender had no influence on students' performance in the biology test after being taught using the context-based instructional approach, the mean difference obtained is 1.10 Ttherefore, both male and female students benefited equally from the context-based teaching strategy.

Hypothesis 1: There is no significant interactive effect of treatment and gender on academic performance

Table 5: ANCOVA Results Obtained on Interactive Effect of Treatment and Gender on Academic Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig
Corrected Model	8691.000[a]	17	511.235	795.255	.000
Intercept	259580.999	1	259580.999	403792.665	.000
Pretest	81.500	10	8.150	12.678	.000
Group	3.490	1	3.490	5.429	.000
Gender	3200.000	1	3200.000	4977.778	.025
Pretest *Group	2131.475	18	118.415	7.010	.000
Pretest * Gender	134.406	17	7.906	.468	.958
Group * Gender	10.328	1	10.328	.611	.437
Pretest * Group * Gender	38.353	7	5.479	.324	.940
Error	27.000	42	27.000		
Total	294378.000	60	294378.000		
Corrected Total	8718.000	59	8718.000		

Table 5 revealed the results of an ANCOVA analysis conducted to determine the interactive effect of treatment (instructional method) and gender on students' academic performance in Biology, controlling for pretest scores. The interaction term of interest is Group * Gender, which tests whether the effect of the instructional method (context-based and conventional) on academic performance differs by gender. Since the p-value (0.437) is greater than the 0.05 significance level, the result is not statistically significant. The result indicates that there is no significant interaction effect between treatment and gender on academic performance in Biology. That is, the effectiveness of the context-based instructional approach did not differ significantly between male and female students. Therefore, the null hypothesis (Ho_3) which states that "There is no significant interaction effect of treatment and gender on students' academic performance in Biology" is not rejected ($F(1, 42) = 0.611$, $p =$

0.437). This indicate that both male and female students responded similarly to the instructional methods used, and gender did not influence the effect of the treatment on academic performance.

Discussion

The findings from the analysis of students' post-test scores showed that those in the Experimental Group (EG), taught using the Context-Based Instructional Approach (CBIA), outperformed their counterparts in the Control Group (CG), who were taught using the conventional method. The mean performance score for the EG was substantially higher than that of the CG, with the difference being statistically significant. This indicates that the CBIA enhanced students' academic performance in biology. This finding aligns with Bennett and Lubben (2019), Imoko, and Ajai (2015), who reported that instructional methods that connect learning to real-life contexts foster deeper understanding, improve motivation, and enhance performance in science subjects. The improved performance of the EG could be attributed to the active, student-centred nature of the CBIA, which promotes critical thinking, problem-solving, and knowledge application—skills essential for mastering biology concepts.

The ANCOVA results indicated no significant interactive effect between treatment and gender on academic performance. This suggests that the superiority of the CBIA over the conventional method in enhancing academic performance was consistent across male and female students. This aligns with the findings of Ezeudu and Obi (2023), who noted that innovative instructional strategies tend to benefit all learners regardless of gender when learning is active and participatory. This result implies that teachers can implement CBIA without concerns about gender bias in performance outcomes.

Overall, the study demonstrates that the Context-Based Instructional Approach is superior to the conventional method in improving both academic performance and retention in biology among secondary school students in Gombe Metropolis. While the method benefits both genders equally in terms of performance, it interacts with gender to influence retention, highlighting the need for gender-sensitive pedagogical planning.

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Evaluation of Human Resources Management Challenges in the Administration of Public Senior Secondary Schools in Sokoto Metropolis, Sokoto State, Nigeria: Recruitment/Induction and Teacher Motivation

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Abstract

The study investigated the evaluation of human resources management challenges in the administration of public senior secondary schools in Sokoto metropolis, Sokoto State: Recruitment/induction and teacher motivation. Three research objectives and three research questions were formulated to guide the conduct of the study. The designed adopted for the study was descriptive survey while the population of the study was 28 Principals and 1400 Teachers in public senior secondary school in Sokoto Metropolis, Sokoto state, Nigeria. Research advisors (2006) table was used to select 28 Principals and 263 teachers sampled for the study using stratified simple random sampling technique. Instrument used for data gathering was a 25-items questionnaire tagged "Evaluation of Human Resources Management Challenges Questionnaire" (EHRMCQ) was used to collect data using four (4) modified likert rating scales to measure participant's responses. The questionnaire was faced and content validated by three experts from educational administration and planning, test measurement and evaluation at Usmanu Danfordiyo University. Reliability of the questionnaire was 0.74 using Cronbach alpha statistic. The research questions were answered using descriptive statistic of frequency count, percentage and mean. The result of the study found that recruitment of teachers posted great challenges to principals in secondary schools in Sokoto Metropolis. This implies that recruitment is not done on the basis of merit and the principals are not involved in the recruitment process. School principals faced a lot of challenges on teacher motivation such as lack of incentives, accommodation, rewards and welfare package etc. The study recommended that, Government should direct its recent policy on state of emergency on education to management of human resources. This could be done through Educational Authorities, Ministries and Boards by monitoring and implanting policies that would enhance efficiency in the recruitment of teacher base on merit and involve principals in the recruitment process. Principals also have a role to play in recognizing teachers who are hard-working by awarding them. This could be done by organizing programmes with presenting certificate of excellent to hardworking teachers to motivate them on the job.

***Keywords**: Recruitment, Teacher Motivation, Strategies, Administration, Challenges*

Introduction

The study is attempted at studying the challenges of principals in managing human resources in secondary schools, the challenges faced by principals in teaching and non-teaching staff could not be over emphasized. It is important to note that education is the tool for national development and it cannot be an instrument per excellence for national development where secondary education teaching is not effectively managed to accomplish it aims and objectives (Alimba, 2017). In the administration of secondary schools, the principals have the highest say, he is the central. He is the man at helms of the affairs who receives all praises and blame in the school. The efficiency of human resources management in schools is called to question both within and outside the profession. Many educationists will fully admit that the school resources are being mismanaged and under-utilized simply because the school lack qualified personnel and management resources needed for the improvement of instructions.

Recruitment and induction are one of the key HRM practice and assists in formal policies, and philosophies that are designed to attract, develop, motivate and retain teacher who ensure the effective functioning of the organization (Syombu, et al., 2019) recruitment is however, not just a simple selection process but also requires management decision making and extensive planning to employ the most suitable manpower. Competition among school organizations for recruiting the best potential candidate has increased focus on innovation, and management decision making and the selectors aim to recruit only the best candidates who suit the corporate culture, ethics and climate specific to the potential organization. The process of recruitment does not however end with application and selection of the right people but involves maintaining and retaining the employees chosen.

The entire success of an organization is based on how an organization keeps its employees motivated and in what way they evaluate the performance of teachers for job compensation. At times management pays more attention to extrinsic rewards but intrinsic rewards are equally important in teacher motivation. Intangible or psychological rewards like appreciation and recognition plays a vital role in motivating teacher and increasing his performance. Nwosu (2018) lamented that commitment of teachers is based on rewards and recognition, prosperity and survival of the organizations is

determined through how they treat their human resource. Intrinsic rewards are rewards within the job itself like satisfaction from completing a task successfully, appreciation from the head teacher, and autonomy, while extrinsic rewards are tangible rewards like pay, bonuses, fringe benefits, and promotions.

According to Hezekiah and Foscar (2022) motivation is the causes that lead people to behave the way they do. He goes on to say that behaviorists consider it extrinsic, whilst others believe it is intrinsic. In general, administrators have the difficulty of developing highly motivated teachers who are actively involved in teaching and learning, open to new ideas and techniques, and devoted to students and change throughout their teaching careers. Secondary school teachers, like employees at all levels of education, must be motivated in order to address individual needs while also achieving organizational goals of improving the quality of education in Sokoto State. For institution such as Teachers Service Board (TSB) to increase performance, it should have highly committed teachers with right attitude toward work.

Consequently, many devoted educationists in all institutions are seriously in demand of dynamic principal who are competent to search for professional growth. This growth coupled with development become necessary in order for school administrator to know the rudiment f proper management of school resources. This is because education is indispensible ingredient of development and a functional right of every individual, it provides mental, physical, ideological and moral training to individuals so as to enable them have full consciousness of their purpose in life and equip the to achieve that purpose. In order to achieve the goals and objectives of educational system particularly in post-primary education Board, there is need for staff professional development.

The paper hinged on scientific theory propounded by Taylor (1963) in Manga (2014) view management as the organization and mobilization of human and material resources in a particular system for achievement of identified objectives. The scientific management theory assumes that the primary functions of management is to maximize production and profit at maximum cost. According to the theory, functional management should be designed to avoid strict military control which in turns people into robot, full pay should only be given for successful completion of work and reduction of in pay for failure to complete tasks. The chief executives should supervise and control

subordinates. A large daily task should be assigned to a worker; there should be train and retraining of workers to make them higher skilled. This theory is still influenced in educational sectors, especially in relation to teaching and learning process in the school.

As observed by Olalube (2011) teacher is expected to render a very higher job performance and the ministry of education is always curious regarding the job performance growth of teachers. This can only be achieved through effective administration and professional growth of teachers. These Taylor principles simply support that administrator and teachers should not be over worked, salaries and wages should be paid accordingly to work done, teachers should be supervised, school administrators should engage in workshops, seminars for training and to update their skill, so as to improve effective and efficient teaching and learning in the school administrators.

This section focused on literature on the evaluation of human resources management challenges in the administration of public senior secondary school in Sokoto metropolis, Sokoto state: Recruitment/induction and teacher motivation.

Samba et al., (2017) assess the decentralized approach process and examined the challenges faced in the application of the approach in secondary teacher recruitment and selection. Arising from the descriptive survey research analysis and interpretation is that despite the crucial role decentralized approach play in Secondary teacher recruitment and selection, there are still some negative aspects that hinder the applicability and implementation of the approach. It was noted that, the approach has led to better staffing in rural remote schools, equity and equality in employment leading to community development and high rate of teacher trainee absorption in the employment sector. However, very little attention is paid to competence of the BOG/PTA, adequate funds, corruption, political interference and teacher performance that challenge the efficiency and effectiveness of the approach.

Abimbowo and Okiki (2024) evaluate the challenges experienced in recruiting teachers in public schools in Nigeria. Some forms of obstacles presented are characterized by bureaucratic bottlenecks, flaws in transparency, lack of adequate funding, and nepotism among others. This paper attempts to explore the chances to improve the method of recruiting teachers through policy reforms, increased financing and merit based choosing criteria. The challenges

include bureaucratic bottlenecks, impunity, and lack of transparency, inadequate funding, and nepotism.

Gizem (2023) conducted a study on challenges in achieving high motivation and performance in educational management: case study of a North Cyprus Public High School, The participants group included 62 teachers. Data were collected using structured interviews. Content and narrative analyses were used to analyze the collected data. Results reveal motivational techniques employed by the school administration to increase performance and their effectiveness as well as the existing limitations to achieve motivation.

Mohammed and Abdulai (2022) examine factors affecting teachers' motivation at secondary schools in the Elliotdale Circuit, South Africa. The research approach adopted was qualitative. The design used was a case study. The purposive sampling technique was used to select a sample size of twenty-two (22) respondents, which comprised principals, teachers, subject advisors and teacher union representatives. Face-to-face interviews were conducted while data collected were analyzed thematically. Findings revealed inadequate teacher-learner support materials in schools, non-payment of temporary teachers' salaries, lack of access roads to schools, lack of secured accommodations for teachers, poverty and lack of electricity and running water in some schools were the factors affecting teachers' job satisfaction and motivation in the secondary schools.

Uzosike (2024) investigated and identifies the key factors influencing teacher motivation in in Junior Secondary Schools in Agbor, Ika South Local Government Area of Delta State. The paper adopted the qualitative research approach a descriptive research design and sampled ten (10) teachers selected from five schools with two teachers selected from each school. Data was collected using interviews and the data was analyzed using thematic analysis based on the objectives and research questions of the study. The paper revealed that the current motivational techniques used by the ministry of education and the Nigerian education service are ineffective. Intrinsic motivations like teachers enjoy teaching as a profession that gives them great deal of satisfaction, teachers recognition and respect, increase the moral of teachers to a lower extent. The paper also showed that, extrinsic motivation such as teachers receiving low salaries, lack of free accommodation, lack of prompt payment of salaries, lack of recognition and financial assistance does not increase teachers' moral to a large extent.

Hezekiah, and Foscar, (2022) investigate factors affecting teacher's motivation in public secondary schools in Teso South Sub-County. Descriptive research design was used. Prior to the study, content validity was determined by incorporating the opinions of content expert, and reliability was determined by testing and retesting, yielding a correlation of 0.8. The study targeted the school principals and teachers. A total of 31 respondents participated in the study. Questionnaires were used to collect data from both teachers and the principal. Data collected quantitatively was analyzed using descriptive statistics such as frequencies and percentages. The study found out that most teachers (64.52%) were satisfied with their jobs, most teachers would seek promotional opportunity elsewhere (32.23%). The study also found out that most of the respondents were satisfied with their current pay (67.74%) teachers are promoted on the basis of their qualifications and performance (38.71%).

Saifillah, et al., (2024) investigate the principal's strategies for enhancing the quality of education through human resource management at MTs Al Anwar Sarang. A qualitative research method was employed and involving in-depth interviews to gather data on the strategies used by the school principal to improve education quality. The data were analyzed using data condensation techniques as described by Miles and Huberman, the study revealed that the principal implemented several effective strategies. These included granting educators the freedom to develop professionally, providing motivation and support, delegating training responsibilities, and involving resource persons. These strategies led to improvements in individual skills and fostered a dynamic, collaborative, and reward-focused school environment.

Barkwang, et al., (2024) the study sought to establish the relationship between the principals' human resource management skills and institutional performance in public secondary schools in the south Rift region, Kenya. It adopted descriptive cross sectional survey research design and correlational research design. Multistage sampling was used to select 166 Principals, 166 senior teachers and 4 County Quality Assurance and Standards Officers. Questionnaires and interview schedules were used to collect data from sampled respondents. Data was cleaned coded and analyzed descriptively and inferentially. Frequency and percentages were used to describe the existing relationship between the variables while hypothesis was tested using regression analysis at 0.05 level of significance. The study established that there is a positive and significant relationship between Principals' human

resource management skills and institutional performance. It also established that some Principals are faced with a lot of challenges relating to human resources management culminating into poor institutional performance.

Ogbouna, *et al.,* (2023) investigate strategies adopted by principal in the management of human resources in public secondary schools in Enugu Education Zone. Two research questions and two null hypotheses were formulated by the study. Questionnaire was used as the instrument used to collected data from the participants. The reliability coefficient of the instrument was determined using Cronbach alpha method. Alpha value of 0.86 was obtained indicated higher reliability of the instrument. Mean and standard deviation were used to answered research questions and t-test inferential statistic was used to test the null hypotheses at 0.05 level of significance. Generally, the study finds out that both male and female agreed that principals should adopted certain strategies involving teachers and student in decision making especially on issue that are of interest to coordinate both staff and student.

Statement of the Problem

In Nigeria schools, two groups of personnel are employed; they are trained and untrained human resources. Managing of human resources in the schools is not an easy task. For a staff to be able to give learning instruction efficiently and effectively for a desire output, he or she must have the teaching methods; one may leave some gaps in the accepted teaching procedures. Human resource management is central to the effective administration of public senior secondary schools. Principals, as school administrators, are directly responsible for ensuring the recruitment of qualified personnel and sustaining teacher motivation for improved teaching and learning outcomes. However, in many public schools, the recruitment process is often fraught with bureaucratic delay, inadequate autonomy for principals in staff selection and a shortage of qualified candidates.

Further evidence, according to Mohammed and Abdulai (2022) demonstrated that African teachers face tremendous challenges and demotivation, several of which are poorly in recruiting/induction of teachers, poor remuneration, poor leadership, students' ill-discipline and lack of career advancement. Hezekiah and Foscar (2022) also present evidence that toward the end of the 1990s; factors that affected teachers' motivation were classified according to the

degree of importance, such as attractive career choices, comparative wages, being praised, favourable working conditions, availability of promotions, the existence of participative decision-making leadership style and good manager-staff relations. These challenges result in staffing gaps, the employment of unqualified teachers. Beyond recruitment/induction, sustaining teacher motivation remains a pressing issue. Many teachers in public senior secondary schools operate under poor working conditions, low remuneration, irregular promotions and inadequate recognition of their efforts. Consequently, morale is low, absenteeism is frequent, and commitment to instructional delivery is often compromised. The cumulative effect of these challenges is a decline in teaching quality, poor student performance, and reduced overall school effectiveness.

While principals are expected to devise strategies to mitigate these problems, their efforts are frequently constrained by limited authority, insufficient resources, and lack of professional support from educational authorities. It is, therefore, imperative to systematically assess the challenges principal's faces in recruitment/induction and teacher motivation, as well as the strategies they employ in addressing them

Objectives of the Study

The main thrust of this study is to investigate evaluation of human resources management challenges in the administration of public senior secondary school in Sokoto Metropolis, Sokoto state: Recruitment/induction and teacher motivation. Specifically, the study is to find out:

1. The challenges faced by principals in recruitment and induction of teachers in the administration of senior secondary school in Sokoto Metropolis, Sokoto state, Nigeria.
2. The challenges faced by principals in teacher motivation of teachers in the administration of senior secondary school in Sokoto Metropolis, Sokoto state, Nigeria.
3. The extent level of strategies employed by principals in dealing with the challenges of managing human resources in the administration of senior secondary school in Sokoto metropolis, Sokoto state, Nigeria.

Research Questions

The following research questions were answered in the study.

1. What are the challenges faced by principals in recruitment and induction of teachers in the administration of senior secondary school in Sokoto metropolis, Sokoto state, Nigeria.
2. What are the challenges faced by principals in teacher motivation of teachers in the administration of senior secondary school in Sokoto metropolis, Sokoto state, Nigeria.
3. What are the extents of strategies employed by principals in dealing with the challenges of managing human resources in the administration of senior secondary school in Sokoto metropolis, Sokoto state, Nigeria.

Methodology

The design of the study was descriptive survey as the study focused on the investigating phenomena that is ongoing. The population of the study consisted of 28 Principals and 1400 Teachers in public senior secondary school in Sokoto Metropolis, Sokoto State, Nigeria. Research advisors (2006) table for determine sample size from a given population was used to select 28 Principals and 263 teachers sampled for the study using stratified simple random sampling technique. Instrument used for data gathering was a 25-items questionnaire adapted by the researcher tagged “Evaluation of Human Resources Management Challenges Questionnaire” (EHRMCQ) was used to collect data using four (4) modified Likert rating scale such as Strongly Agreed (SA) = 4, Agreed (A) = 3, Strongly Disagree (SD) = 2, Disagree (D) = 1 to measure participants responses. The questionnaire was faced and content validated by three experts from educational administration and planning, test measurement and evaluation at Usmanu Danfordiyo University. In order to ensure the Reliability of the questionnaire, the questionnaire was pilo-tested using test-retest method and the reliability coefficients of 0.74 was obtained using Cronbach alpha statistic. The research questions were answered using descriptive statistics of frequency count, percentage and mean.

Results

The research questions were answered and presented in table 1 below.

Research Question One: What are the challenges faced by principals in recruitment and induction of teachers in the administration of senior secondary school in Sokoto metropolis, Sokoto state, Nigeria. The research question was answered and presented in table 1 below:

Table 1: Mean Rating on the Challenges of Teachers Recruitment/Induction

S/N	Items statement	A		D			
		Freq	%	Freq	%	Mean	Remark
1	Teachers/Principals are involved in the recruitment of new teaching staff.	67	23.1%	224	76.9%	2.46	disagreed
2	Recruitment of teachers and appointment of principals are based on merit.	40	13.7%	251	86.2%	2.27	disagreed
3	Enough teachers are recruited to replace higher teacher turn over.	61	21%	230	79%	2.41	disagreed
4	Workshop and training are often organized for both teachers and principals..	61	21%	230	79%	2.41	disagreed
5	Induction programs are organized for new teaching staff and	120	41.2%	171	58.7%	2.82	Agreed
6	principals.	240	82.3%	51	17.5%	3.64	Agreed
7	Principals are contacted to summit proposal of required teaching staff before recruitment is done.	61	20.9%	235	80.8%	3.72	Agreed
8	Teachers are providing with the transportation allowances during induction training.	260	89.3%	31	10.5%	3.78	Agreed
	Teachers are provided with food for feeding allowance during the induction training.						
	Total	**114**	**40%**	**177**	**60%**	**2.94**	**Agreed**
	Grand Mean (χ)						**2.94**

Field Survey, 2025

Table 1 showed the responses of the participants sampled for the study to items 1,2,3,4, 5, 6, 7 and 8. Items above the criterion mean score of 2.50 used for decision making implied that they are agreed while items below the criterion mean implied that they are disagreed in response to the item raised. In summary item one (2.46, disagreed), item two (2.27, disagreed), item three (2.41, disagreed), item four (2.41, disagreed) while 5,6,7 and 8 agreed participants views in the effect of politics on school funding and it impact on technology integration in instructional delivery in public senior secondary schools in Sokoto State. The average mean score of 2.93 however implied that the participants agreed on the effect of politics on school funding in public senior secondary schools in Sokoto state.

Research Question Two: What are the challenges faced by principals in teacher motivation of teachers in the administration of senior secondary school in Sokoto Metropolis, Sokoto state, Nigeria. The research question was answered and presented in table 2 below.

Table 2: Mean Rating on the Challenges of Teacher Motivation

S/N	Items statement	A		D			
		Freq	%	Freq	%	Mean	Remark
1	Principals/teacher is provided with houses for their accommodation.	141	48.5%	150	51.5%	2.91	Agreed
2	Principals/teachers are provided with welfare package such as food stuffs.	50	17.2%	241	82.8%	2.34	Disagreed
3	Principals/teachers are provided with incentives.	70	24%	221	75.7%	2.48	disagreed
4	Hardworking principals/teachers are rewarded at the end of every term or session.	34	11.7%	257	88.3%	2.24	disagreed
5	Govts provide principals/teachers with loan to cater for their need.	242	83.2%	62	16.8%	3.75	Agreed
6	Promotion of teachers is done automatically in due time.	91	31.3%	200	68.7%	2.62	Agreed
7	Teachers are provided with office equipment and instructional materials.	80	30.6%	202	69.4%	2.48	disagreed
	Total	**101**	**35.2**	**190**	**64.8**	**2.68**	**Agreed**
	Grand Mean ($\bar{x}$)					**2.68**	

Field Survey, 2025

Table 2 showed the responses of the participants sampled for the study to items 1,2,3,4, 5, 6 and 7. Items above the criterion mean score of 2.50 used for decision making implied that they are agreed while items below the criterion mean implied that they are disagreed in response to the item raised. In summary item 1, 5, and 6 agreed with mean score of (2.91, 3.75, and 2.62), while item 2, 3, 4 and 7 disagreed with mean scores of (2.34, 2.48, 2.24 and 2.48) in the effect of politics on school location and it impact on technology integration in instructional delivery in public senior secondary schools in Sokoto State. The average mean score of 2.99 however implied that the participants agreed on the effect of politics on school location in public senior secondary schools in Sokoto state.

Research Question Three: What are the extents of strategies employed by principals in dealing with the challenges of managing human resources in the administration of senior secondary school in Sokoto metropolis, Sokoto state, Nigeria. The research question was answered and presented in table 2 below.

Table 3: Mean Rating on the Strategies Employed by Principals on Managing Challenges of Human Resources

S/N	Items statement	HE		LE			
		Freq	%	Freq	%	Mean	Decision

1	The principal introduces induction policy for newly appointed teachers.	79	27 %	212	79.2 %	2.54	High Ext
2	Principal do writes to inform the Teachers Service Board fir the required teachers needed by school.	48	16.5 %	200	68.7 %	2.03	Low Extent
3	The principal encourage team work so teachers can achieve their target.	291	100 %	0	0%	4.00	High Ext
4	The principal often rewards hardworking teachers for motivation	226	77.7 %	65	22.3 %	3.55	High Ext
5	The principal organized end of the year party for his staff in order to thank them for a job well-done.	55	18.9	236	81.1	2.37	Low Extent
6	Remuneration is given to teachers who were engaged in other activities that are not part of their	50	17.1 %	214	82.8 %	215	Low Extent
7	job. To compensate government efforts the principals organize	71	24.4 %	220	75.6 %	1.73	Low Extent
8	workshop/seminar for his teacher. The principals try as much as he can to provide accommodation for	22	7.6	269	92.4	1.22	Low Extent
9	teachers. The principal involves his teachers	68	%	223	%	2.46	Low Extent
10	in decision making. The principal's cheeks scheme of work so that teachers can achieve their target.	285	23.3 %	6	76.6 %	3.95	High Ext
			97.9		2%		
	Total	**132**	**46.26**	**159**	**53.74**	**2.06**	Low Ext
	Grand Mean (χ)					**3.06**	Low Ext

Field Survey, 2025

Table 3 showed the responses of the participants sampled for the study to items 1,2,3,4 to 10. Items above the criterion mean score of 2.50 used for decision making implied that they are higher extent level while items below the criterion mean implied that they are low extent level in response to the item raised. In summary item one (2.54. high extent), item three (4.00, higher extent) and item ten (3.95, higher extent) answered higher extent level on the strategies employed by principals on managing the strategies employed by principals on managing challenges of human resources challenges of human resources, while item 2, 5, 6, 7, 8 and 9 responded lower extents. The average

mean score of 2.69 however implied that the participants agreed on the effect of politics on

Summary of the Findings

The following, are the summary of the findings:

1. Recruitment of teachers posted great challenges to principals in secondary schools in Sokoto Metropolis. This implies that recruitment is not done on the basis of merit and the principals are not involved in the recruitment process.
2. School principals faced a lot of challenges on teacher motivation such as lack of incentives, accommodation, reward and welfare package etc. in dealing with the
3. Despite the school principals faces challenges in senior secondary both little efforts were employed by the principals in dealing with the challenges.

Discussion

This section further discussed the summary of major findings.

The finding of research question one indicated that major challenges lie in the recruitment of teachers. Recruitment is not based on merit and school principal are not involved in the recruitment process. This could result in recruiting in competent teachers or those who do not met the needs of schools. These challenges could adversely affect instructional practice in the school. For example, when incompetent teachers are recruited on the basis of politics and power, overall academic success of students is likely to be affected in respective of measures taken by the principals. This finding concurred with the finding of Kipsoi and Sang (2008) who found out that selection and recruitment of teachers is not fairly and transparency done as priority is given to certain individuals. The finding is in line with the finding of Samba et al,. (2017) who revealed that very little attention is paid to competence of the BOG/PTA, adequate funds, corruption, political interference and teacher performance that challenge the efficiency and effectiveness of the approach

Finding of the study in research question two showed that school principals faced a lot of challenges on teacher motivation. These challenges could be summed on the basis of incentives, reward, promotion and provision of

teaching materials. The stage of this motivational element is poor and could present drastic challenge in the retention of teachers. This finding was consisted with the finding of Bennel (2004) who found out that teacher working in public secondary school systems are poorly motivated. He maintained that standards of professional conduct and performance of teachers are low and failing in many countries as a result of lack of incentives, welfare package, accommodation and good working environment to boost the morale of teachers on of the general response of the respondents indicates that despite of the fact that recruitment/induction of teacher and motivation of teachers pose a great challenges to school principals, yet little effort were made by the principals in dealing with these challenges. The finding agrees with the finding of Mohammed and Abdulai (2022) who found that there are inadequate teacher-learner support materials in schools, non-payment of temporary teachers' salaries, lack of access roads to and from schools, lack of secured accommodations for teachers, poverty and lack of electricity and running water in some schools were the factors affecting teachers. The finding is in agreement with the finding of Uzosike (2024) who revealed that the current motivational techniques used by the ministry of education and the Nigerian education service are ineffective.

Finding of the study in research question three showed that school principals make a little effort on applying of strategies for dealing with the challenges of recruitment /induction and teacher motivation. The finding contradicts with the finding of Saifillah, *et al.* (2024) whose study revealed that the principal implemented several effective strategies. These included granting educators the freedom to develop professionally, providing motivation and support, delegating training responsibilities, and involving resource persons. These strategies led to improvements in individual skills and fostered a dynamic, collaborative, and reward-focused school environment. the finding collaborates with the finding of Ogbouna, *et al.* (2023) who found that both male and female agreed that principals should adopted certain strategies involving teachers and student in decision making especially on issue that are of interest to coordinate both staff and student.

Conclusion

In line with the findings of the study, the study concluded that human resources management posed a great challenge to principals in senior secondary schools. This could be witnessed from improper recruitment of

staff, lack of training among others. School principal also faced a lot of challenges on teacher motivation such as lack of incentives, accommodations, medical health services, rewards, welfare package that will serve as extrinsic motivation to teachers.

Recommendations

1. Government should direct its recent policy on state of emergency on education to management of human resources. This could be done through Educational Authorities, Ministries and Boards by monitoring and implanting policies that would enhance efficiency in the recruitment of teacher base on merit and involve principals in the recruitment process.
2. Principals also have a role to play in recognizing teachers who are hard-working by awarding them. This could be done by organizing programmes with presenting certificate of excellent to hardworking teachers to motivate them on the job.
3. The principals should also employ effective strategies in dealing with the challenges in senior secondary schools, where such challenges are be young capacity, he/she should imminently report to the appropriate body for proper measures.

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Enhancing Educational Outcomes: The Role of Effective Supervision and Inspection in Schools

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Abstract

Effective supervision and inspection are pivotal in elevating educational standards, as explored in the seminar "Enhancing Educational Outcomes: The Role of Effective Supervision and Inspection in Schools." This session investigate how structured oversight can lead to improved teaching practices, enhanced student performance, and overall school effectiveness. The discussion emphasize the aspects of effective supervision and inspection, including clear communication, constructive feedback, and collaborative professional development. The discussion explores the relationship between supervision, inspection, and education results, highlighting evidence-based strategies that foster a culture of continuous improvement. The seminar also addresses the challenges faced in implementing effective practices, such as resistance to change and resource limitations. By showcasing successful case studies and best practices, this event aims to equip educators and administrators with the tools necessary to enhance educational quality. Ultimately, it advocates for a proactive approach to supervision and inspection that not only ensures accountability but also supports educators in their professional growth, guaranteeing that all students receive a quality education.

***Keywords**: Supervision, Inspection, Performance, Schools Educational Standard*

Introduction

Supervision and inspection are widely recognized as critical elements of the educational system, essential for ensuring quality and accountability in schools. As educational landscapes change, the need for effective supervision and inspection becomes increasingly vital to address the diverse needs of learners and evolving teaching practices. The COVID-19 pandemic, for instance, uncovered long-standing challenges in public education, further complicated by weaknesses in existing accountability frameworks. This paper aims to investigate the theoretical foundations that support effective

supervision and inspection, underscoring their importance in enhancing educational outcomes.

Current accountability measures in education, which often depend heavily on standardized testing, have not effectively driven the improvements in student achievement that were anticipated. Recent policy analysis contends that the assumptions underlying school accountability must be critically examined and routinely re-tested if states are to design models that actually improve student outcomes (Center for Assessment, 2023)

In agreement, Leader and Pazey (2023) advocate for a more balanced approach to school accountability that considers various factors beyond test scores. This shift necessitates the adoption of comprehensive systems that promote shared responsibility among all stakeholders.

The central thesis of this paper asserts that a robust theoretical framework in supervision and inspection not only enhances teaching practices but also directly influences student performance. By understanding and applying these theoretical concepts, educators and administrators can create an environment that fosters continuous improvement and professional growth. Kwan's (2020) research highlights the key role of transformational school leadership in establishing a motivated and capable teaching environment, ultimately leading to better student outcomes. Transformational leaders encourage educators, enhancing their commitment, skills, and motivation to innovate in their teaching methods. Pennell (2023) notes that transformational leadership primarily aims to inspire and guide followers to exceed their expectations.

Supervision and inspection are essential processes within the educational system, each fulfilling distinct yet interrelated functions aimed at improving teaching and learning.

Supervision is generally viewed as a continuous, supportive effort focused on enhancing instructional practices and facilitating professional growth among educators (Kwan, 2020). This process involves a collaborative relationship between supervisors and teachers, wherein supervisors offer guidance, resources, and constructive feedback. The primary goal of supervision is to improve teaching effectiveness, which, in turn, positively impacts student learning outcomes. Effective supervision relies on open communication,

enabling supervisors and teachers to identify strengths and areas needing improvement, thus cultivating a culture of ongoing development (Kwan, 2020)

Conversely, inspection is often a more structured and evaluative process. It entails assessing schools against established standards and benchmarks to ensure compliance and accountability. Inspections are typically conducted by external agencies or educational authorities, focusing on a school's performance in various aspects, such as academic achievement, resource management, and adherence to regulations. The aim of inspections is to provide a comprehensive evaluation of a school's effectiveness and to hold it accountable for its results. While inspections can yield valuable insights into how a school operates, they can also place pressure on educators and institutions to meet specific performance criteria.

The interaction between supervision and inspection is vital for fostering a balanced educational environment. Supervision emphasizes support and improvement, while inspection centers on accountability and evaluation. Together, these processes form a framework that promotes high-quality education. Understanding the definitions and roles of supervision and inspection is crucial for developing effective strategies that enhance educational outcomes and support educators' professional development. (Pennell, 2023)

Theoretical frame work

Instructional Supervision: Instructional supervision is a foundational theory that positions supervisors as instructional leaders within educational settings. This approach emphasizes the importance of direct engagement with teachers to enhance their classroom practices. Supervisors act as coaches, providing ongoing support, resources, and constructive feedback tailored to individual educators' need (Ategwu, & Ogundipe, 2024).

Transformational Leadership Theory: Transformational leadership theory plays a significant role in educational supervision by emphasizing the importance of inspiring and motivating educators. This theory posits that effective supervisors act as transformational leaders who cultivate a shared vision for educational improvement, thereby encouraging teachers to exceed their own expectations (Leithwood & Jantzi, 2022).

Distributed Leadership Theory: Distributed leadership theory emphasizes the concept of shared leadership within educational settings. This theory challenges the traditional view of leadership as a top-down process, advocating for a collaborative approach where leadership responsibilities are distributed among various stakeholders, including teachers, staff, and even students. Harris, (2023)

The humanistic approach also prioritizes reflective practice, encouraging teachers to engage in self-reflection about their teaching experiences. This reflective process promotes self-awareness and personal growth, enabling educators to identify their strengths and areas for improvement. By fostering a culture of reflection, supervisors can help teachers develop a deeper understanding of their instructional practices and pursue continuous growth. Maslow, (2021).

Educational inspection is guided by various theoretical frameworks that shape the evaluation and accountability processes within schools. These theories provide insights into how inspections can be conducted effectively to foster improvement and ensure educational quality. Below are some key theories related to educational inspection:

Accountability theory emphasizes the responsibility of educational institutions to demonstrate their effectiveness in achieving desired outcomes. This theory posits that schools and educators must be held accountable for student performance and overall organizational effectiveness. Inspections based on this theory focus on evaluating whether schools meet established standards and benchmarks, ensuring that they are fulfilling their obligations to students and the community (Elmore, 2021).

Aspects of accountability theory include the establishment of clear performance metrics and the use of data to assess school effectiveness. Inspections often involve comprehensive evaluations that consider academic results, compliance with regulations, and resource management. By holding schools accountable, this theory aims to promote transparency and drive improvements in educational quality.

Quality assurance theory centers on maintaining and improving the quality of education through systematic evaluation processes. This theory posits that regular inspections are essential for identifying strengths and areas for

improvement within schools. Inspections guided by quality assurance principles help ensure that educational practices align with established standards and best practices (Harvey & Green, 2023).

In this context, inspections serve as a mechanism for continuous improvement, encouraging schools to reflect on their practices and implement necessary changes. Quality assurance frameworks often include feedback loops, allowing schools to respond to inspection findings and enhance their performance over time.

Developmental evaluation theory focuses on the role of inspections as a tool for fostering growth and development within educational institutions. Unlike traditional evaluative approaches that primarily assess compliance, developmental evaluation emphasizes the importance of providing constructive feedback and support to schools. This theory views inspections as opportunities for dialogue and collaboration between inspectors and educators (Patton, 2022).

Inspections guided by developmental evaluation principles prioritize formative assessments, which focus on identifying areas for improvement rather than merely assigning ratings. This approach encourages schools to engage in reflective practices and develop action plans for enhancement, fostering a culture of continuous learning and improvement.

Components of Effective Supervision and Inspection

Clear Communication: Clear communication in educational supervision is the backbone of successful leadership and is pivotal in fostering a supportive environment where educators feel valued and understood (Robinson & Timperley, 2022). Effective communication involves a two-way exchange where supervisors clearly articulate expectations and actively listen to teachers' concerns, creating a safe space for open dialogue (Hattie, 2021). Supervisors should utilize constant two-way communication instead of a lecturing style for relationship-building, trust, psychological safety, and positive experiences (Zepeda, 2023). By employing empathy and thoughtful questioning, supervisors can help teachers gain insights into their strengths and areas for improvement, ultimately enhancing their ability to make informed decisions (Leithwood, 2022).

Constructive Feedback: Constructive feedback is a powerful tool for enhancing learning and development, fostering a culture of continuous improvement and personal growth (Shute, 2023). Effective feedback should be specific, actionable, and timely, providing concrete examples and suggestions for improvement rather than vague criticism (Hattie & Timperley, 2022). Balancing positive reinforcement with constructive criticism helps build confidence and motivates teachers to overcome weaknesses (Kluger & DeNisi, 2021). Supervisors should encourage self-reflection, promoting a growth mindset and ownership of professional development (Dweck, 2020). By providing focused, specific feedback, supervisors can help teachers understand learning objectives, choose the best strategies, and monitor their progress, leading to improved instructional practices and student outcomes (Hattie, 2021).

Collaborative Professional Development: Collaborative professional development involves teachers working together to improve teaching and learning through shared planning, observation, and reflective dialogue (DuFour & Fullan, 2022). This approach fosters a community working towards a common goal, creating a support system that boosts morale and enhances student outcomes (Glickman, 2022). Collaborative learning initiatives correlate with heightened professional satisfaction, confidence in innovative teaching methods, and a deeper understanding of diverse learning needs (Hargreaves & Fullan, 2021). By engaging in shared lesson planning and peer support, teachers can exchange ideas, refine their skills, and build a robust foundation for future professional growth (Timperley et al., 2022). Continuous professional development featuring peer support, shared planning, and collaborative work scrutiny contributes to a culture of professional learning and a shared sense of purpose (Zepeda, 2023).

Constructive Feedback

The Role of Formative Assessment in Supervision: Formative assessment is essential in educational supervision, acting as a guiding light that helps teachers refine their practices. Unlike summative assessments, which evaluate performance at the end of a term, formative assessments are woven into the daily fabric of teaching. They provide ongoing feedback that supports teachers in identifying their strengths and areas for improvement (Black & Wiliam, 2020).

In practice, this means supervisors can engage in classroom observations, conduct peer reviews, and encourage self-assessments. These activities allow supervisors to gather valuable insights into how teaching is unfolding in real time (Hattie, 2021). When supervisors provide constructive feedback that is specific and timely, teachers can make immediate adjustments that enhance their instruction. This continuous feedback loop not only empowers educators but ultimately benefits students, creating a responsive and dynamic learning environment.

Theoretical Perspectives on Feedback Mechanisms: Theoretical perspectives on feedback offer valuable insights into how feedback can drive growth and development in educational settings. One key idea is encapsulated in Feedback Intervention Theory, which suggests that effective feedback should focus on both the task at hand and the process used to achieve it (Kluger & DeNisi, 2021). This means that feedback is not just about what went wrong but also about how to improve and learn from experiences.

Hattie and Timperley (2022) further break down feedback into four levels: feedback about the task, the process, self-regulation, and the self. This framework encourages supervisors to provide feedback that not only addresses what teachers are doing but also encourages them to reflect on their teaching strategies and personal growth. Moreover, the idea of "feedforward" emphasizes the proactive nature of feedback. Instead of merely evaluating past performance, supervisors can guide teachers toward future improvements (Hattie, 2021). This approach fosters a growth mindset, encouraging educators to view feedback as a pathway to continuous development rather than a critique of their skills.

Collaborative Professional Development: Collaborative professional development is all about teachers coming together to enhance their skills and teaching practices. This approach creates a supportive community where educators share their experiences, insights, and strategies. By working together, teachers can learn from each other, provide constructive feedback, and tackle challenges as a team. This collaboration can lead to more effective teaching methods and a stronger sense of camaraderie among staff. One of the best aspects of this collaboration is that it allows teachers to address common challenges together. For instance, they might brainstorm ways to better engage students or figure out how to incorporate new technologies into their classrooms. Sharing successes and setbacks helps everyone build a collective

knowledge base, enriching their practices and improving the school environment overall. Collaborative professional development promotes ongoing learning through regular meetings, peer observations, and co-teaching opportunities. This continuous interaction keeps teachers motivated and committed to their professional growth, making them feel more connected to their work and colleagues.

Impact of Professional Development on Teaching Practices

The impact of professional development on teaching practices can be transformative. When teachers participate in meaningful development opportunities, they often experience several positive outcomes:

1. **Enhanced Teaching Skills**: Professional development provides teachers with new strategies and techniques that can make their teaching more effective. This might involve learning about differentiated instruction or classroom management tactics that better meet their students' needs.

2. **Increased Student Engagement**: As teachers refine their skills, they often discover new ways to engage students. This leads to more interactive and dynamic classroom environments where students feel motivated to participate actively.

3. **Improved Student Outcomes**: Research consistently shows that effective professional development correlates with better student performance. When teachers are equipped with effective strategies, their students tend to excel academically.

4. **Stronger Professional Relationships**: Collaborative professional development fosters deep connections among educators. Building these relationships creates a supportive atmosphere where teachers feel comfortable sharing ideas and seeking help. Trust and mutual respect among colleagues are crucial for this collaboration to thrive.

5. **Empowerment and Agency**: Engaging in professional development empowers teachers and gives them ownership over their teaching practices. This sense of agency can lead to increased job satisfaction and a commitment to continuous improvement.

Distinguishing Supervision and Inspection

i. **Supervision:** Think of supervision as an ongoing partnership between teachers and their leaders. It focuses on providing support, mentoring, and constructive feedback to help educators improve their teaching practices. According to Ijaduola (2017), this process involves regular observations and professional development, creating an environment where teachers feel empowered to grow and innovate.

ii. **Inspection:** In contrast, inspection is like a formal check-up for schools. It evaluates overall performance against set standards, looking closely at teaching effectiveness, leadership, student outcomes, and adherence to policies (Bush, 2020). While inspections are essential for accountability, they tend to be less frequent and more structured.

Impact on Educational Outcomes

i. **Improved teaching practices:** both supervision and inspection can lead to better teaching. Supervision provides ongoing support, while inspections help identify areas for improvement (Ong'ondo & Jwan, 2023). When teachers receive constructive feedback, they can refine their skills and try new strategies in the classroom.

ii. **Enhanced student achievement:** research shows that effective supervision and inspection can positively impact student learning. When teachers improve their practices, students tend to perform better (Core, 2023). This connection is vital for ensuring that all students receive a high-quality education.

iii. **Accountability and standards:** inspections play a critical role in maintaining high educational standards. By evaluating schools against established criteria, inspections help identify weaknesses and recommend improvements (Greany & Higham, 2023). This accountability ensures that schools are striving for excellence.

iv. Professional development: both processes contribute to the professional growth of teachers. Supervision provides continuous opportunities for learning and support, while inspections can highlight areas where additional training may be needed (COJDS, 2024). This ongoing development is crucial for fostering a culture of improvement.

v. **Supportive Learning Environment:** Effective supervision creates a collaborative and supportive atmosphere for both staff and students. When leaders foster open communication and provide guidance, it helps to build a positive school climate that is conducive to learning (Keiser University, 2025).

Challenges and Considerations

i. **Implementation is Key:** The success of supervision and inspection hinges on how well they are implemented. Clear communication and constructive feedback are essential for making a real impact (PLA,

ii. **Inadequate resources:** insufficient training and logistical support for supervisors and inspectors can limit their effectiveness (Himalayan 2023). Schools need the right support to thrive.

iii. **Resistance from stakeholders:** sometimes there is push-back from teachers or administrators regarding supervision and inspection processes (Ngene *et al.,* 2024). Building trust and collaboration is crucial to overcoming these challenges.

iv. **No automatic improvement:** it is important to remember that inspections do not automatically lead to better educational outcomes; their effectiveness depends on how they are conducted and on the context of the school (Klerks *et al.,* 2022)

v. **Potential negative consequences:** some inspection models may inadvertently create negative effects on teaching and learning Jones, et al., 2025). It's essential to approach inspections thoughtfully to avoid unintended consequences.

Conclusion

Effective supervision and inspection play pivotal roles in enhancing educational outcomes within schools. Supervision, through its focus on ongoing support and professional development, empowers teachers to refine their instructional practices and engage students more effectively. By fostering a collaborative environment, supervision promotes a culture of continuous improvement where educators feel valued and motivated to grow. On the other hand, inspection serves as an essential tool for accountability, ensuring that

schools meet established educational standards. By evaluating performance and providing constructive feedback, inspections identify areas for improvement and drive schools to strive for excellence. The insights gained from inspection processes can lead to targeted professional development, ultimately benefiting both teachers and students.

However, the effectiveness of supervision and inspection hinges on their thoughtful implementation. Clear communication, adequate resources, and a shared commitment to improvement are critical for maximizing their impact. Building trust among educators, administrators, and stakeholders is essential to fostering a positive school climate where both teaching and learning can thrive. As schools continue to evolve and address new challenges, the integration of effective supervision and inspection will remain vital to enhancing educational outcomes. Together, these processes can create a responsive and dynamic educational environment that supports the growth of both educators and students, ultimately leading to a more successful and enriching learning experience.

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Undergraduate Arabic and Islamic Studies Students' Perceptions of Status of Educational Statistics in Awarding B.Ed. Degree in Education in Nigerian Universities

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Abstract

This study examined undergraduate Arabic and Islamic Studies students' perceptions of status of Educational Statistics in awarding B.Ed Degree in Education in Nigerian universities. Descriptive survey was used the research design adopted in the study. The population of the study was all Arabic and Islamic Studies students in all universities in Kwara, Nigeria. Simple random sampling technique was used in the study to select the respondents. The instrument used in the study was a researcher self-developed questionnaire titled "perceptions of undergraduate students of Arabic and Islamic Studies in the Status of Educational Statistics in awarding B.Ed Degree in Arabic and Islamic Studies" (PUSAISSESDAIS). Validity and reliability of the instrument were carried out and the reliability coefficient of 0.84 was recorded. Percentage was used to describe demographic representation of the respondents while mean and standard deviation were used to answer all research questions raised in the study. Independent sample t-test was the inferential statistics used in the study to test all hypotheses. The study revealed that undergraduate students of Arabic and Islamic Studies encounter some challenges in some aspects of Educational Statistics. The study also showed that there was significant difference between male and female undergraduate Arabic and Islamic Studies students' perceptions of the status of Educational Statistics in awarding B.Ed Degree in Arabic and Islamic Studies. However, the study showed that there was no significant difference between public and private undergraduate Arabic and Islamic Studies students' perceptions of the status of Educational Statistics in awarding B.Ed Degree in Arabic and Islamic Studies. The study concluded that calculating grouped data and testing hypotheses with Chi Square, t-test and others are very difficult to learn for Arabic and Islamic Studies students in Kwara State. The study therefore, recommended that lecturers in Department of Arts Education in all universities in Nigeria should design a way to make the course simpler for Arabic and Islamic Studies students so that at the end of the program the students would be able to perform little analysis.

***Keywords**: Perceptions, undergraduate students, Arabic and Islamic Studies, status, Educational Statistics*

Introduction

Statistics is a field of knowledge that contributes large portions to the analysis and explanation of results generated from the filed works in research. In education, statistics is an integral component that cannot be removed among the courses that must be passed before a student can graduate in Nigerian universities. Above all, the significance of educational statistics in research cannot be over-emphasised. According to Adenomon (2022) statistics is the process of making inferences from observation in order to tackle real life problems in all aspects of human endeavuors including education. Similarly, National Open University of Nigeria (2020) defined statistics as a set of facts or data collected, analyzed and interpreted in order to deduce inferences. This is done through the use of statistical tools such as descriptive and inferential statistical tools. Furthermore, Adelodun and Awe (2013) defined it as the process of gathering, organizing and interpreting data to make meaningful decision. Awe et al. (2015) explained that the statistics was introduced to strengthen students' knowledge of analysis in research.

Statistics can be categorized in to two forms: descriptive and inferential statistics. Awoniyi and Aderanti (2013) described descriptive statistics as a form of statistics where data generated are described with the aid of measures of central of tendencies and variability such as: frequency, percentage, mean, median, standard deviation, range and variance among others. This form of statistics allows researchers to present their results through the use of charts. Inferential statistics on the other hand, is the system of sampling certain representation from the whole population and the data collected would be analyzed and used to draw conclusion (Olosunde, 2005). This type of statistics helps researchers to detect relationships existing among data collected from the population via parametric and non-parametric statistical tools.

Islam is a religion that values calculation and application of values for solving religious, social and political problems in the society. Importance of numbers and calculation in the life of Muslims are numerously mentioned in the Quran and Hadith of Prophet Muhammad (PBUH). Quran says: *"It is We who revive the dead; and We write down what they have forwarded, and their traces. We tallied all things in a clear record" (36:12).* This verse pointed out important aspect of statistics which is tally and record. This shows how Islam values numbers, calculation and recording. In another portion of Quran, Allah says:

"it is He who made the sun radiant, and the moon a light, and determined phases for it, that you may know number of years and the calculation. Allah did not create all this except with truth. He details the revelation for a people who know" (10:12). The above verse showed the pivotal position occupied by the application of calculation in Islam. Therefore, Islamic Studies students should be embodiment of the knowledge about number and calculation.

Prophet Muhammad (PBUH) was reported to have said*: "The month (of Ramadan) may consist of twenty nine days; so when you see the new moon observe fast and when you see (the new moon again at the commencement of the month of Shawwal) then break it, and if the sky is cloudy for you, then calculate (and complete thirty days) (Sahih Muslim1081).* This Prophetic statement is confirming the importance of calculation in Islam and to know that without calculation there is no existence. With the aid of calculation many Islamic activities are carried out including *Salah* (prayer), *Sawm* (fasting) and *Hajj* (pilgrimage). Hence, students of Arabic and Islamic Studies are not expected to develop phobia for learning statistics in the universities because the knowledge of educational statistics which is a branch of Mathematics gives students opportunity to present their results logically. Therefore, this study examined perceptions of undergraduate students of Arabic and Islamic Studies in the status of Educational Statistics in awarding B.Ed Degree in Arabic and Islamic Studies.

Contents of Educational Statistics in the Faculty of Education in Nigerian universities

Educational Statistics can be described as scientific techniques applied in transforming information generated from well-planned survey or observation into quantifiable data than can be subjected to quantitative or qualitative analysis in order to deduce reliable inferences from the set hypotheses (Awoniyi & Aderanti, 2013). This is done by researchers in the field of education to get meaningful conclusions or decisions that could be used to solve educational problems in the societies. Educational Statistics is designed to play essential roles in research and among its roles are the following as listed in Awoniyi and Aderanti (2013):

1. Educational Statistics assists researchers transform verbal information into quantifiable expression for the purpose of making meaningful decisions;

2. It helps researchers to analyze data for making credible decisions in research;
3. It enables researchers to describe the characteristics of population and sample in research;
4. It allows researchers to obtain a generalization from the entire population through inferences from quantifiable observation made from sample used; and
5. it enables researchers to develop skills on how to manage and interpret statistical data in research

The contents of Educational Statistics in the Faculty of Education subsume aspects of Statistics under the descriptive and inferential statistics. According to NOUN (2020) Educational Statistics in the Faculty of Education is a compulsory course that all students in the Faculty of Education must pass before having Bachelor in Education irrespective of the department. Educational Statistics designed for undergraduate students in Faculty of Education is majorly centered on descriptive and inferential statistics and therefore the contents of the course could be outlined as follows: meaning and significance of Statistics, concept and roles of educational Statistics, educational research process, evaluation, test and measurement, nominal, ordinal, interval and ratio scales, graphical representation of data (bar chart, histogram and others), measures of central tendency (mean, media & mode) and measures of variability or dispersion (range, mean deviation, standard deviation e.t.c) among others. Therefore, many Arabic and Islamic Studies students in the university find it difficult to pass this course even some change their course just because of Educational Statistics. In addition, some Arabic and Islamic Studies students prefer pursuing their Master Degree in Faculty of Arts where pure Arabic and Islamic Studies is offered because of Educational Statistics as long the status of the course remained unchanged (compulsory) in the Faculty of Education. Therefore, undergraduate Arabic and Islamic Studies students need to be educated on the significance of this course and the role it plays in our academic, political, social and religious lives.

Many scholars from different disciplines had worked on the impact of educational statistics in production of effective and efficient outcomes in research. Badau (2020)'s study on educational management and research performance of universities in North Eastern Nigeria concluded that there is low research performance in educational management in North Eastern universities in Nigeria. This could be traced to high level of phobia attached to

the knowledge of educational statistics which forms the bedrock for the production of viable and reliable research in the universities.

Similarly, Aina et al. (2021) observed that application of educational statistics tools in analyzing data in research is facing multi-faceted challenges in among Nigerian graduate due to corruption, laziness, poor supervision and high rate of attrition among others. It shows from this submission that poor supervision and laziness are the problems that strengthen Arabic and Islamic Studies students' phobia in developing interest in learning educational statistics. Furthermore, Ndayebom and Aregbesola (2023) discovered that poor mentorship, corruption, mismanagement, weak research instruction and brain-drain to mention a few are among the major problems that make learning educational statistics more difficult for the students to enjoy. This implies that if Arabic and Islamic Studies students could discover the immense benefits in learning educational statistics they might have preferred pursuing high degrees in Education.

Undergraduate Arabic and Islamic Studies students in the Faculty of Education need to be treated as education students and therefore educational statistics is an unavoidable course for all students in the Faculty of Education. Ubom et al. (2019) suggested that effective research leads to productivity, creativity and sustainability in all aspects of human life and the sensitive part of research is logical presentation of findings. Hence, without the knowledge of educational statistics, analysis and presentation of findings will be difficult.

Objectives of the Study

The aim of this study was to examine perceptions of undergraduate students of Arabic and Islamic Studies in the status of Educational Statistics in awarding B.Ed Degree in Arabic and Islamic Studies in Kwara State, Nigeria. Specifically, the study investigated:

1. The aspect of educational statistics that is difficult for undergraduate Arabic and Islamic Studies students to learn in research methodology
2. Undergraduate Arabic and Islamic Studies students' perception in the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies based on gender

3. Undergraduate Arabic and Islamic Studies students' perception in the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies based on type of institution

Research Questions

The following research questions were answered during the course of the study:

1. Which aspect of educational statistics is difficult for undergraduate Arabic and Islamic Studies students to learn in research methodology?
2. How do undergraduate Arabic and Islamic Studies students perceive the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies based on gender?
3. What is the level of undergraduate Arabic and Islamic Studies students' perception in the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies based on type of institution?

Research Hypotheses

H_{01}: there is no significant difference between male and female undergraduate Arabic and Islamic Studies students' perception in the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies.

H_{02}: there is no significant difference between public and private undergraduate Arabic and Islamic Studies students' perception in the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies.

Methodology

This study examined undergraduate Arabic and Islamic Studies students' perceptions of the status of Educational Statistics in awarding B.Ed Degree in Arabic and Islamic Studies in Kwara State, Nigeria. The descriptive survey research design was used in the study. The population of the study was all undergraduate students in all universities in Kwara State. Simple random sampling technique was used to sample three universities from all ten universities available in Kwara State (one public and two private universities).

Similarly, simple random sampling technique was used to sample 100 Arabic and Islamic Studies students of 200L from each sampled university in Kwara State and therefore a total number of 300 respondents were used in the study. Hence, 100 Arabic and Islamic Studies students were sampled from public and 200 from private sampled universities in Kwara State. 180 male and 120 female undergraduate Arabic and Islamic Studies students were sampled from all selected universities in Kwara State.

The instrument used in the study was a researcher self-developed questionnaire titled "perceptions of undergraduate students of Arabic and Islamic Studies in the Status of Educational Statistics in awarding B.Ed Degree in Arabic and Islamic Studies" (PUSAISSESDAIS). The instrument was divided into two sections A & B. Section A described the demographic data of the respondents while B contained two different sections: A hosted five items on the aspects that undergraduate Islamic Studies students find difficult and B embodied five items on Arabic and Islamic Studies students' perceptions of the status of Educational Statistics in awarding B.Ed Degree in Arabic and Islamic Studies. Different likert scales such as: Highly Difficult (HD), Slightly Difficult, and Not Difficult (ND) and Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) were used for sections A, & B respectively.

Both descriptive and inferential statistics tools were used in the study; frequency count and percentage were used to describe demographic data of the respondents. Mean and standard deviation were used to answer research questions while independent t-test was used to test all hypotheses at 0.05 level of significance.

Results

Table 1: Demographic presentation of undergraduate Arabic and Islamic Studies students

Variable	Frequency	Percentage
Gender		
Male	180	60.0
Female	120	40.0
Total	**300**	**100.0**
Type of Institution		
Public	100	33.3
Private	200	66.7
Total	**300**	**100.0**

Table 1 displayed that out of 300 undergraduate Arabic and Islamic Studies students sampled in the study, 180 (60%) were males while 120 (40%) were females undergraduate Arabic and Islamic Studies students. This showed that the population of male students of Arabic and Islamic Studies participated in this study was higher than the population of female of Arabic and Islamic Studies. Similarly, the table presented that 100 (33.3%) was sampled from public university while 200 (66.7%) was sampled from private universities in Kwara State. This also implied that the percentage of respondents sampled in private universities was higher than the percentage of respondents from public university.

Answering Research Questions

Research Question 1: Which aspect of educational statistics is difficult for undergraduate Arabic and Islamic Studies students to learn in research methodology?

Table 2: Aspect of educational statistics that is difficult for undergraduate Arabic and Islamic Studies students to learn in research methodology

S/N	ITEMS	HD	%	SD	%	ND	%
Tabulating grouped data In Educational Statistics is difficult		160	53.3	92	30.7	48	16
I attempt questions on mean, media and mode of ungrouped data		0	0	40	13.3	260	86.7
I find it difficult to draw bar charts and histogram		137	45.7	106	35.3	57	19.0
I can differentiate between continuous and categorical data in Statistics		83	27.7	126	42.0	91	30.3
Calculating t-test, Chi Square and others are my major problems in Educational Statistics		234	78.0	66	22.0	0	0

Note*:* HD=Highly Difficult, SD= Slightly Difficult, ND= Not Difficult

Table 2 displayed that items 1 & 5 are the aspects of Educational Statistics that are difficult for Arabic and Islamic Studies undergraduate to learn due to high percentage of Arabic and Islamic Studies students that find them difficult. This is the reason why many Arabic and Islamic Studies students running away from education just because of Educational Statistics.

Research Question 2: What is the level of undergraduate Arabic and Islamic Studies students' perception in the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies?

Table 3: The level of undergraduate Arabic and Islamic Studies students' perception in the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies

S/N	ITEMS	SA	A	D	SD	X	SD	Decision
	I perceive Educational Statistics the most difficult course for me in the department	160	140	0	0	3.53	0.500	High
	I always get low grade in Educational Statistics due to my lack of good background in Mathematics	100	131	49	20	3.04	0.874	High
	Educational Statistics status should be reviewed in such a way that the decision will favour Arabic and Islamic Studies students	200	100	0	0	3.67	0.472	High
	I see the status of Educational Statistics in the Faculty of Education is considerate	100	171	20	9	3.21	0.692	High
	The status of Educational Statistics is normal because it is a compulsory course in the Faculty	131	100	40	29	3.11	0.974	High
				Average Mean		3.21		High

Note: SA=Strongly Agree, A-Agree, D=Disagree, SD=Strongly Disagree, X=Mean, SD=Standard Deviation

Table 3 revealed that the level of undergraduate Arabic and Islamic Studies students' perception in the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies is high with average mean of 3.21. Similarly, the mean recorded in all items were high which implied that undergraduate Arabic and Islamic Studies students' phobia towards learning the course is very high. This might be the reason why only very few among Arabic and Islamic Studies students put interest in learning educational statistics in the Faculty of Education.

Testing Hypotheses

H01: there is no significant difference between male and female undergraduate Arabic and Islamic Studies students' perception in the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies.

Table 4: Independent t-test showing significant difference between male and female undergraduate Arabic and Islamic Studies students' perception in the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies

Variable	N	Mean	SD	df	t	sig.	Decision
Male	180	13.76	1.320				
				298	-5.52	0.000	Rejected
Female	120	14.52	0.894				

Source: Data output from SPSS (version 25th) (2024).

Given that t-value of -5.52, df=298 and p-value 0.000<0.05, therefore the result of independent sample t-test showed that there was significant difference between male and female undergraduate Arabic and Islamic Studies students' perception of the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies in Nigeria. This implied that both male and female undergraduate students of Arabic and Islamic Studies have different perceptions on the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies. It also showed the mean scores of 14.52 that female students of Arabic and Islamic Studies have make them have high perception on the difficulty of the course among compulsory courses in the Faculty of Education.

H02: there is no significant difference between public and private undergraduate Arabic and Islamic Studies students' perception in the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies.

Table 5: Independent t-test showing significant difference between public and private undergraduate Arabic and Islamic Studies students' perception in the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies

Variable	N	Mean	SD	df	t	sig.	Decision
Public	100	13.90	1.321				
				298	-1.739	0.065	Not Rejected
Private	200	14.15	1.168				

Source*:* Data output from SPSS (version 25th) (2024)

Given that t-value of -1.739, df=298 and p-value 0.065>0.05, therefore the result of independent sample t-test showed that there was no significant difference between public and private undergraduate Arabic and Islamic Studies students' perception in the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies. This implied that both public and private undergraduate students of Arabic and Islamic Studies have similar perceptions on the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies. It also showed the mean scores of 14.15 that private students of Arabic and Islamic Studies have make them consider the course more difficult for the students of Arabic and Islamic Studies.

Discussion

The findings of the study showed that the population of male undergraduate students of Arabic and Islamic Studies participated in this study were higher than the population of female. Similarly, the percentage of respondents sampled in private universities was higher than the percentage of respondents from public university in Kwara State. Furthermore, the findings of the study displayed that majority of undergraduate students of Arabic and Islamic Studies were not good enough in tackling some aspects of Educational Statistics this was showed in their perception about the difficulty of the course with average mean score of 3.21. This is line with the study of Adenomon (2022) that students are not well introduced into the knowledge of real Statistics at secondary school level which paves way for unnecessary anxiety for the course at tertiary institutions.

In the same vein, the findings of the study showed that there was significant difference between male and female undergraduate Arabic and Islamic Studies students' perception in the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies and the finding showed that female have high difficulty in taking the course. This showed that male students of Arabic and Islamic Studies are trying to tackle the contents averagely. The findings also revealed that there was no significant difference between public and private undergraduate Arabic and Islamic Studies students' perception in the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies and the result confirmed that undergraduate students of Arabic and Islamic Studies in private universities in Kwara State encountered much difficulty in tackling some aspects in the course.

Conclusion

Based on the findings of the study, it was concluded that calculating grouped data and testing hypotheses with Chi Square, t-test and others are very difficult to learn for Arabic and Islamic Studies students in Kwara State. It was also concluded in study that the level of undergraduate Arabic and Islamic Studies students' perception in the status of educational statistics in awarding B.Ed Degree in Arabic and Islamic Studies is high with average mean of 3.21.

Recommendations

The study recommended that:

1. Lecturers in Department of Arts Education in all universities in Nigeria should design a way to make the course simpler for Arabic and Islamic Studies students so that at the end of the program the students would be able to perform little analysis.
2. University management should try to lessen difficulty aspects of Educational Statistics for all students in the Department by arranging extra class tutorial irrespective of students' gender.
3. Qualified lecturers in the field of Educational Statistics should be employed in both public and private universities in Kwara State to reduce the difficulty status of Statistics for all students.

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Design and Evaluation of Three-Dimensional Visualization Module for Teaching Cell Biology in Nigerian Secondary Schools

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Abstract

Teaching cell biology in Nigerian secondary schools presents significant challenges due to the abstract nature of cellular concepts and limited access to laboratory resources. This study aimed to develop and evaluate a Three-Dimensional instructional Module module designed to enhance students' spatial visualization skills, academic performance and retention ability in cell biology. Guided by the ADDIE instructional design model and grounded in the Cognitive Theory of Multimedia Learning, Multiple Intelligence Theory and Constructivism, the module was tailored to the Senior Secondary School Biology Curriculum. The module was implemented using a quasi-experimental research design and incorporated interactive 3D models and was delivered using the 5Es inquiry-based learning model; Engage, Explore, Explain, Elaborate and Evaluate. The six-week intervention was implemented in six purposefully selected secondary schools in Sokoto State, Nigeria, with three instructional strategies (2D Charts, Microscopy, and AR) employed to compare learning outcomes. The evaluation of the module involved expert validation by seven biology education specialists. Content validity was assessed using Gregory's framework and expert consensus, achieving an average agreement score of 88.6%, indicating high suitability and instructional value. The module addressed key curriculum topics, including cell structure and function, types of unicellular organisms and differences between plant and animal cells. Findings demonstrate that the 3D module provided an engaging and effective learning experience, fostering improved academic performance, spatial visualization skills and retention ability among learners. The study concludes that the integration of the module into biology instruction holds strong potential for addressing pedagogical challenges and enhancing biology education in resource-limited contexts like Nigeria.

Keywords*:* Cell Biology, Visualization-Based Instruction, Spatial Visualization Skills, Academic Performance & Retention Ability

Introduction

Teaching Cell Biology presents peculiar challenges due to its abstract and microscopic content. Students are required to comprehend complex structures and processes that are invisible to the naked eye, which often leads to

difficulties in comprehension and retention. Traditional teaching methods, usually relying on two-dimensional (2D) diagrams and limited practical microscope use, have shown limitations in providing an interactive and engaging learning experience. These methods frequently result in rote memorization rather than meaningful conceptual understanding (Achor, Imoko, & Ajai, 2020; Ubulom, Kalejaiye, & Ojediran, 2022).

Recent advances in educational technology offer avenues to address these challenges. Augmented Reality (AR), for example, allows learners to interact with three-dimensional (3D) models of cells and organelles in a more immersive way, which enhances spatial visualization and conceptual clarity (Bacca, Baldiris, Fabregat, Graf, & Kinshuk, 2014; Ibáñez & Delgado-Kloos, 2018). Research shows that AR supports active learning by enabling manipulation and exploration of cellular structures, fostering deeper engagement and improving academic performance (Lai, Chen, Lin, & Chang, 2022; Omurtak & Zeybek, 2022). Additionally, the integration of gamification elements in AR modules has been found to increase motivation and reduce cognitive overload, further promoting effective learning (Gopalan, Nordin, Baharuddin, & Zainuddin, 2022).

This study seeks to develop and evaluate a 3D instructional module for teaching Cell Biology to Senior Secondary School students in Sokoto State, Nigeria. The module integrates AR technology and by leveraging the instructional strategy, the module aims to enhance students' spatial visualization skills, academic performance and retention ability of cell biology concepts, while addressing the practical realities of resource constraints in Nigerian schools.

Objectives

The objectives of the study are to:

1. To identify the instructional gaps, learner needs and existing challenges in teaching Cell Biology to senior secondary school students in Sokoto State, Nigeria.
2. To design a 3D-Visualization based learning module aligned with the national Biology curriculum and tailored to the learning context of Nigerian senior secondary schools.

3. To develop a 3DVisualization-Based module that includes interactive 3D cell structures, simulations and assessment tools for teaching Cell Biology.
4. To implement the module in selected senior secondary schools in Sokoto State in cell biology instruction.
5. To generate expert index to evaluate the effectiveness of the module in improving students' spatial visualization, academic performance and retention ability of Cell Biology.

Methodology

The study adopted a descriptive survey to conduct preliminary study where teachers were interviewed to assess the need for the module. A Quasi-experimental design was adopted to determine the effect of CBARM on students' spatial visualization skills, academic performance and retention ability alongside a descriptive survey design was used to determine the validity, of the module as well as expert views on the appropriateness of the instructional module for learning cell biology among secondary school students. Seven (7) biology education specialists were used to evaluate the developed module during the development phase. The use of seven experts is supported by Brown and Green (2012), who state that "A small but well-chosen panel of experts can provide highly valuable insights and achieve a consensus regarding the effectiveness of educational materials" (p. 104).

Stage 1: Analysis

The analysis phase is foundational to the ADDIE instructional design model, as it informs all subsequent stages through a comprehensive understanding of learner characteristics, instructional goals, contextual challenges and curriculum requirements. In designing a 3D visualization-based instructional module for teaching Cell Biology to senior secondary school students in Nigeria, a multi-layered needs analysis was undertaken. This included a review of relevant literature, curriculum content and insights from interviews with experienced Biology teachers in Sokoto State, as well as findings from national education performance reports. A summary of the January 2025 field survey is presented in Table 1, highlighting teacher perspectives on challenges and resource constraints in Sokoto State obtained through Teachers Interview Form (TIF)

Table 1: Summary of Preliminary Findings (January 2025 – Sokoto State)

Theme	Findings	Frequency/Examples
Participants	Secondary school Biology teachers (n = 12)	From 6 public and 2 private schools
Access to Lab Equipment	Majority reported limited or no access to functioning microscopes	9 out of 12 schools had no operational microscopes
Use of Visual Aids	Visual aids rarely used beyond textbook images	10 teachers reported reliance on 2D textbook diagrams
Teaching Approach	Lecture-based and exam-oriented	All participants used chalk-and-talk methods
Challenges in Teaching Cells	Difficulty explaining microscopic structures without visuals	All teachers expressed concern
Student Difficulties	Students struggle with visualizing organelles and cell processes	Mentioned by 11 out of 12 teachers
Attitude Toward Technology	Positive attitude toward visual/AR tools, especially if offline-capable	8 teachers very supportive; 4 cautiously optimistic
Suggested Solutions	Need for interactive, visual and low-bandwidth tools	Offline 3D models and animations most commonly requested

Source: Researcher, 2025

Learner Profile and Context

The target audience comprises Senior Secondary School 2 (SSS2) students, mostly between14 and 17 years, who are studying Biology in accordance with the Nigerian Educational Research and Development Council (NERDC) curriculum. SS 2 are the most stable class in senior secondary school. At this level, students are expected to engage with abstract biological concepts such as cell structure and function, organelles, cell division using microscopy. Such topics require a high level of visual-spatial visualization skills and conceptual thinking.

However, findings from both literature and preliminary teacher interviews in Table 1 above revealed that many students struggle to conceptualize microscopic and subcellular structures. According to Achor, Imoko, and Ajai (2020), a significant number of Nigerian students exhibit poor understanding of cell biology, mainly due to the abstract nature of the content and its presentation through static 2D textbook images. This challenge is compounded in under-resourced states such as Sokoto State, where access to laboratory equipment, microscopes and prepared slides remains limited, as reported by several teachers during field interviews conducted in January 2025 (see Table 1 above).

Instructional Gaps and Pedagogical Challenges

The traditional instructional approach in many Nigerian secondary schools is still dominated by lecture-based, chalk-and-talk methods, often lacking visual and experiential components. These methods are insufficient for facilitating **s**patial visualization, a cognitive skill that is essential for mastering cell biology (Chiou & Chang, 2017). Teachers interviewed in Sokoto noted that many students resort to rote memorization due to a lack of visual aids, leading to poor retention and a superficial grasp of biological structures and functions.

Research by Garzón and Acevedo (2019) further emphasizes that passive instructional strategies fail to support higher-order thinking skills or conceptual clarity. In particular, they highlight the value of Augmented Reality (AR) and interactive visual tools in fostering learner engagement and comprehension of abstract scientific content. Similarly, Mayer's (2014) Cognitive Theory of Multimedia Learning argues that poorly designed instructional content can overload students' working memory, thereby hindering comprehension and long-term retention. These findings align with teachers' observations that students often become overwhelmed when complex processes like mitosis or meiosis are explained without accompanying visualizations.

Moreover, a review of WAEC Biology Chief Examiners' Reports (2022) confirms that questions related to cell biology frequently receive poor responses from candidates. These reports attribute this trend to students' inability to visualize cellular structures and processes and to the inadequate use of instructional materials during classroom teaching.

Learner Needs

Based on the findings from the interviews and the literature consulted, it is evident that students require a more interactive, visual and learner-centered approach to cell biology. There is a clear need for instructional solutions that:

1. Make invisible structures (e.g., organelles, chromosomes) visible and manipulable
2. Reduce cognitive load through multimedia integration
3. Encourage constructivist learning, where students actively build understanding through exploration

Tools such as interactive 3D models offer promising avenues to address these needs. According to Bacca et al. (2014), visual-based applications not only

boost motivation and engagement but also lead to measurable improvements in academic performance and content retention in biology.

Furthermore, field interviews revealed that teachers in Sokoto are receptive to the use of digital learning tools, particularly if such tools are offline-capable, curriculum-aligned and simple to use. One teacher noted, *"If students can see what we are describing—like a moving cell or a dividing nucleus—they will not forget it."*

Instructional Goal Setting

In respect of the instructional gaps, learner needs and contextual constraints, the overall instructional goal of the module is to improve students' spatial visualization skills, academic performance and retention ability in Cell Biology by:

1. Providing visual and interactive representations of cellular structures and processes
2. Enhancing spatial visualization skills through 3D models and virtual simulations
3. Supporting active learning and retention through engaging, multimodal resources

This goal aligns with the broader aim of integrating technology-enhanced pedagogy into Nigerian secondary education, in accordance with the Federal Ministry of Education's ICT in Education Policy (2019), which advocates for the use of digital tools to improve teaching and learning outcomes.

Table 2: Summary of Key Findings from the Analysis Phase

Area of Analysis	Key Insight
Learner Profile	SSS2 Biology students, 14–17 years old, working with abstract curriculum content
Instructional Gaps	Lack of visual aids, limited lab resources, reliance on lecture-based methods
Learning Challenges	Difficulty visualizing microscopic structures; poor performance in cell biology topics
Needs Identified	Interactive, offline-capable visual modules; support for spatial learning
Teacher Feedback	Positive disposition toward visual tools; concern about resource constraints
Instructional Goal	Improve conceptual clarity, performance, and retention through visualization

Source: Researcher, 2025

Table 2 presents insights from experienced biology teachers, gathered through the Teachers Interview Form (TIF). They described SSS2 students as struggling with abstract topics like cell biology, largely due to a lack of visual aids and hands-on resources. Lessons often rely too heavily on lectures, making it harder for students to grasp microscopic concepts. The teachers stressed the need for interactive, offline visual tools to help students learn better, especially through spatial and visual methods. While they were open to using such tools, they also pointed out concerns about limited resources. These insights helped shape the goal of using visualization to boost students' understanding, performance, and retention.

Stage 2: Design

As a rider to the Analysis phase, this Design stage presents an instructional framework for a 3D visualization-based Cell Biology module, targeting Senior Secondary School 2 (SSS2) learners in Nigeria, in accordance with the NERDC Biology curriculum (2009)**.** The module is structured to respond to the gaps and learner needs in Sokoto State, with a focus on spatial visualization, conceptual clarity, and experiential engagement.

To ensure pedagogical soundness, the design incorporated three learning theories:

- The Cognitive Theory of Multimedia Learning informed the integration of visual and auditory elements to enhance understanding and reduce cognitive overload.
- Gardner's Theory of Multiple Intelligences guided the inclusion of varied instructional approaches (e.g., visual-spatial, linguistic, and interpersonal strategies) to accommodate diverse learners.
- The Constructivist Learning Theory shaped the learner-centered, inquiry-based design, encouraging active participation and knowledge construction through exploration and collaboration.

Instructional Model: The 5Es Learning Cycle

Instruction was structured using the 5Es instructional model; Engagement, Exploration, Explanation, Elaboration, and Evaluation to scaffold learning

progression and promote metacognitive reflection. The AR strategy is deployed within its own independent 5Es cycle, ensuring that the strategy is self-contained and aligns with distinct cognitive goals.

Learning Objectives

By the end of the Visualization-based instructional module, students should be able to:

1. Define the concept of a cell and explain its importance.
2. Identify and describe unicellular organisms and their characteristics.
3. Explain the different forms in which cells exist.
4. Compare the structure and function of plant and animal cells.
5. Differentiate between plant and animal cells using a comparison table.

Instructional Strategy Design

a. **Pedagogical Purpose:** To develop spatial visualization skills, enhance learners' understanding of cellular components and improve retention of cell biology content in 3D space.

Implementation:

a. Students use an AR mobile app call Cell World V.10 and resources from www.sketchfab.com to interact with manipulable 3D models of, unicellular organisms, plant and animal cells.

b. Each cell component includes embedded audio explanations and interactive labels.

c. Learners explore the cell structures by controlling and rotating animations in real-time.

5Es Flow:

a. *Engage*: Students use AR Cell World to reveal cell models.

b. *Explore*: Manipulate and investigate components of the cell.

c. *Explain*: Teacher guides discussion using probing questions.

d. *Elaborate*: Students create screen recordings with narrated walkthroughs.

e. *Evaluate*: Individual performance task and peer assessment during intervention. Answer standardized tests on spatial visualization skills, academic performance and retention ability after the period of intervention.

Summative Assessments

- Cell Biology Spatial Visualization Skills Test for SSII (CBSVSSSII) developed by the researcher, validated by 6 experts, subjected to pilot test where a validity and reliability indexes of 0.86 and 0.91 were obtained respectively. It contains 20 items testing spatial visualization skills in cell biology.

- Cell Biology Academic Performance Test for SSII (CBAPTSSII) developed by the researcher, validated by 6 experts, subjected to pilot test where a validity and reliability indexes of 0.89 and 0.97 were obtained respectively. It contains 30 objective questions testing spatial academic performance in cell biology.

- Cell Biology Retention Test for SSII (CBRTSSII). A repeat of the CBAPTSSII after three weeks from the end of the date of administration of the posttest.

This Design phase articulates a modular, theory-driven instructional plan that responds to the analysis findings and operationalizes visualization strategy as distinct, measurable and scalable intervention.

Stage 3: Development

The Development phase of the 3D visualization-based module for teaching Cell Biology operationalizes the pedagogical plans laid out during the Design stage. The module content aligns with the Nigerian NERDC curriculum and is organized around six core weekly topics. For each topic, instructional content was developed separately across three independent visualization strategies. The module was implemented using the 5Es instructional model; *Engage, Explore, Explain, Elaborate, Evaluate* and is designed to allow for

comparative evaluation of it impact on students' spatial visualization skills, academic performance, and retention.

Instructional materials, student and teacher activities and assessment instruments were developed in accordance with expert feedback. The module was reviewed by seven Biology Education specialists, and all constructive feedback was incorporated into the final version. The main activities to be carried out in each phase of the 5Es were properly spelt out for easy and proper implemented. See tables 3.

Content Covered

1. Concept of cell.
2. Single celled organisms.
3. Forms in which cells exist; free-living, colonies, filaments and tissues.
4. General cell structure.
5. Differences between plant and animal cells.

Table 3: 3D Visualization-Based Learning Module for Teaching Cell Biology for AR Strategy

Week	Topic	Behavioral Objectives	5Es Phase	Teacher Activity	Student Activity	AR Learning Resources	Expected Outcome
Week 1	Concept of Cell	1. Define a cell2. Identify basic structures of a cell3. Differentiate unicellular organisms	E1: Engage	Play a short video on the history of the cell	Watch and reflect	Video + AR preview of a simple cell	Students become interested in microscopic life
			E2: Explore	Launch AR model of Amoeba and Spirogyra	Manipulate models: rotate, zoom, label	AR app with 3D models of Amoeba and Spirogyra	Students identify features of unicellular organisms
			E3: Explain	Ask guided questions about cell parts and organelles	Answer using AR observations	On-screen labels and audio guide in app	Students explain basic structures of a cell
			E4: Elaborate	Present new models: Euglena and Paramecium	Record AR walkthroughs with narration	Screen recording tool + AR app	Students differentiate unicellular organisms
			E5: Evaluate	Assess understanding via oral quiz and spatial task	Present and explain walkthroughs	Peer and teacher evaluation	Students define cell and list features
Week 2	Single-celled Organisms	1. Define unicellular organisms2. State characteristics of unicellular organisms3. Differentiate prokaryotic and eukaryotic cells	E1: Engage	Launch AR model of Amoeba	Observe rotating AR model	3D AR models from Sketchfab or app	Students engage with unicellular life
			E2: Explore	Ask: “How many cells does Amoeba have? Can it perform all life processes?”	Reflect on guided questions	-	Students begin identifying unicellular features
			E3: Explain	Explain unicellular nature using 3D interaction	Interact with cell structures	AR app zoom/rotate tools	Students articulate characteristics of unicellular organisms

Week	Topic	Behavioral Objectives	5Es Phase	Teacher Activity	Student Activity	AR Learning Resources	Expected Outcome
			E4: Elaborate	Introduce Paramecium, Spirogyra, Euglena	Compare models	AR/3D models	Students distinguish among unicellular organisms
			E5: Evaluate	Ask review questions to assess understanding	Respond to evaluation prompts	-	Students demonstrate comprehension of cell types
Week 3	Forms in which cells exist: Free-living and Colonies	1. Explain forms of cellular existence2. Differentiate free-living and colonial cells	E1: Engage	Display 3D AR models of Amoeba, Paramecium, Euglena	Interact with each model	3D models	Students recognize individual cellular organisms
			E2: Explore	Ask: “Where and how do these organisms live?”	Reflect on habitat and independence	-	Students relate structure to lifestyle
			E3: Explain	Explain free-living vs colonial cells	Internalize explanation	Teacher discussion with AR	Students articulate differences
			E4: Elaborate	Display Volvox model to illustrate colonies	Explore Volvox model	3D AR model of Volvox	Students recognize colonial cellular organization
			E5: Evaluate	Ask review questions	Answer based on models and discussion	-	Students explain both forms of cellular existence
Week 4	Forms in which cells exist: Filaments	1. Explain filamentous cell forms2. Identify how cells form tissues	E1: Engage	Present 3D models of Spirogyra and Ulothrix	Observe and describe models	3D AR models	Students visualize cell arrangements

Week	Topic	Behavioral Objectives	5Es Phase	Teacher Activity	Student Activity	AR Learning Resources	Expected Outcome
	and Tissues						
			E2: Explore	Ask students to describe arrangement	Compare cell arrangements	-	Students understand linear vs complex forms
			E3: Explain	Explain nature of filaments and tissues	Internalize structure differences	-	Students describe organization clearly
			E4: Elaborate	Show onion and cheek cells in 3D	Explore and reflect	3D models	Students grasp multicellular tissue structure
			E5: Evaluate	Assess understanding with review questions	Respond to prompts	-	Students identify filamentous and tissue-forming cells
Week 5	General Cell Structure	1. Identify plant and animal cell structure2. Explain organelle functions	E1: Engage	Display 3D plant cell model	Explore 3D plant cell	Cell World app or Sketchfab	Students engage with plant cell anatomy
			E2: Explore	Highlight and zoom into organelles	Interact with organelles	-	Students observe boundaries and features
			E3: Explain	Describe functions of organelles	Connect structure to function	-	Students explain organelle roles
			E4: Elaborate	Show animal cell and compare	Compare with plant cell	AR animal cell model	Students distinguish key organelle differences
			E5: Evaluate	Assess understanding with tasks	Participate in quizzes/assignments	-	Students explain and compare structures effectively

Week	Topic	Behavioral Objectives	5Es Phase	Teacher Activity	Student Activity	AR Learning Resources	Expected Outcome
Week 6	Comparison of Plant and Animal Cells	1. State similarities between plant and animal cells2. Identify key differences	E1: Engage	Display plant and animal cells side by side	Observe models in AR	Comparative 3D AR models	Students recognize visual distinctions
			E2: Explore	Ask: "What do you notice?"	Identify similarities and differences	-	Students make initial comparisons
			E3: Explain	Clarify distinguishing and shared features	Take notes and reflect	Real-time annotation	Students understand comparison
			E4: Elaborate	Emphasize key differences (e.g., chloroplasts)	Discuss insights	-	Students elaborate on comparisons
			E5: Evaluate	Conduct comparative Q&A	Respond and summarize findings	-	Students summarize key points between cell types

Source: Researcher, 2025

Stage 4: Implementation of the Module

The 3D visualization-based instructional module was implemented using a quasi-experimental design in six purposefully selected secondary schools across Sokoto State. The module was delivered over six weeks, with instruction facilitated by the lead researcher and two trained Biology specialists to ensure consistency. Schools were assigned to three experimental groups based on existing characteristics and logistics. This setup maintained ecological validity while allowing reliable comparison of instructional outcomes across groups. The three treatment groups included:

1. **Group A: AR Strategy** – Students interacted with three-dimensional cellular models using the *Cell World* mobile application and selected models from Sketchfab.com.
2. **Group B: Microscopy Strategy** – Students used light microscopes and prepared slides of various cell types.
3. **Group C: 2D Chart Strategy** – Students learned using illustrative wall charts and diagrammatic worksheets.

All groups followed the 5Es inquiry-based learning model**;** Engage, Explore, Explain, Elaborate, Evaluate, to foster conceptual development and spatial visualization. Across the six weeks, instruction covered the following core cell biology topics:

1. The concept of the cell
2. Unicellular organisms
3. Forms in which cells exist (free-living, colonial, filamentous, and tissues)
4. General structure and functions of plant and animal cells
5. Comparative analysis of plant and animal cells

Instructional activities included:

1. Viewing video clips on the history of the cell
2. Observing 2D illustrations, microscope slides, and interactive AR cell models
3. Engaging in inquiry-driven discussions to compare and contrast cell structures
4. Completing structured activities aligned with each phase of the 5Es model

The six-week duration represented a moderately extended intervention, aligning with Cheung and Slavin's (2013) findings that sustained interventions are more effective and generalizable than short-term ones. The researcher closely monitored the process to ensure consistent use of resources, adherence to instructional strategies and fidelity to the instructional model across all sites, while actively mitigating bias**.**

Stage 5: Evaluation of the Module

The evaluation phase involved subjecting the 3D Visualization-Based Module to expert review in order to assess its efficacy in meeting the research objectives. A panel of seven biology education specialists was engaged for this purpose. The selection of a small, focused group of experts is supported by Brown and Green (2012), who note that "a small but well-chosen panel of experts can provide highly valuable insights and achieve a consensus regarding the effectiveness of educational materials" (p. 104).

To assess content validity, criteria established by Kasim and Ahmad (2018) were adopted. These criteria recommend that instructional materials should: (i) address the instructional needs of the target audience, (ii) employ effective implementation methods, (iii) allocate sufficient time for delivery, (iv) improve students' academic performance, and (v) foster positive attitudes toward learning. In addition to these, the researchers included further indicators such as clarity and precision of instructional items, visual appeal and legibility of the module and the presence of guiding questions that support sustained student engagement. Furthermore, Gregory's (2000) content validity framework was applied to quantitatively determine the validity of the module, as outlined in Table 5.

Table 7: Gregory Content Validity Criteria

S/N	Range Value	Validity Criteria
1	80-100	Very High
2	60-79	High
3	40-59	Medium
4	20-39	Low
5	0-19	Very Low

Source: Retnawati (2015)

Similarly, Oussema, Kirkegaard and Petersen, (2020) reported that the percentage of experts' agreement for each criterion of an instructional module

should be 70% and above as good validity while below 70% is not good validity. Therefore, the validity of module is presented in Table 4.

Table 8: Expert consensus on the validation of the module

SN	Item	Good	Not Good	Remark
1	Clarity and direction of items	91	9	Good
2	Stages are logically arranged	94	6	Good
3	The module is attractive and legible	86	14	Good
4	The instructional material is user-friendly	86	14	Good
5	There are adequate driving questions to drive learning	86	14	Good
6	Promote learners' active engagement and participation	86	14	Good
7	The module could improve cell biology instruction, academic performance and spatial visualization skills	97	3	Good
8	Adequate time for the delivery was allocated	80	20	Good
9	The CBARM is appropriate for the targeted level of students	91	9	Good
	Average consensus	88.6%	11.4%	Good

Source: Field Work (2025)

Table 4 shows that all the criteria in the instructional material have 70% and above experts' consensus, and the average experts' consensus is 88.6%. This shows consensus among the seven experts, the module has good content validity and suitable for the target population (Oussema et al, 2020; Polit, Beck & Owen; 2007; & Retnawati, 2015).

Conclusion

This study focused on the development and evaluation of an instructional module aimed at enhancing 3D visualization module for the teaching and learning of cell biology in Nigerian senior secondary schools. The module was systematically designed following the ADDIE instructional design framework and its quality was validated by both content and technology experts. To assess its efficacy, the module was implemented through a quasi-experimental research design involving six selected secondary schools in Sokoto State. Expert evaluations yielded an average agreement score of 88.6%, indicating strong validity and reliability of the module for instructional purposes. Consequently, the module has the potential to serve as an effective teaching resource for improving students' spatial visualization skills, academic performance, and retention ability in cell biology across Nigerian secondary schools.

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A Comparative Study of Virtual and Traditional Field Trips on Secondary School Students' Performance and Retention of Pollution Concepts in Zamfara State

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Abstract

This study compared the Effects of Virtual and Traditional Field Trips on Secondary School Students' performance and Retention of Pollution Concepts in Zamfara State. The study adopted quasi-experimental design involving experimental and control groups. The population of the study consists of 806 SS 1 Biology students from 8 Science Secondary Schools in Zamfara State, comprising 658 boys and 148 girls. A purposive sampling technique was used to select two schools with comparable characteristics. A total of 102 students were obtained from the two intact classes selected. The instruments used for data collection was pollution performance test (alternative A and B). Alternative A was used for pretest and posttest while alternative B was used for post-posttest. The instrument was validated by one experienced biology teacher and one test and measurement expert. A reliability coefficient of 0.76 and 0.80 were obtained for alternative A and B respectively after pilot study. The statistical tools used for data analyses include Mean, Standard Deviation and independent t-test. Findings revealed that secondary school students taught pollution concepts using virtual field trips performed better compared to those taught with physical field trips. Conversely, the result also indicated that students learned about pollution through physical field trips had better long-term retention than those experienced the concept using virtual field trip. It is recommended that, government should endeavour to equip all secondary schools within the state with resources need for virtual learning, as technology is seen to improved students' performance and retention of pollution concepts.

Keywords*:* Virtual Field Trips, Physical Field Trips, performance, Retention, Pollution Concept, Secondary School Students

Introduction

The world as a global community lays much emphasis on science and technology. The attainment of science and technology at all levels of education depends on the teaching effectiveness measured in terms of the knowledge of what to teach, how to teach and when to teach it (Oyegun, 2013). In today's era of science and technology, there is a great need to improve quality of education especially science education. This can be possible by bringing fundamental changes through ICT driven innovative teaching and learning strategies that can provide students centered learning environment which makes learning processes more interesting to the students (Tafa, Olanriwaju & Adamu, 2020). The rapid growth of technology in schools and its integration into teaching reshaped the interaction of teachers, students, curricula and technologies, and eventually transformed the learning environment (Uğur, Saria, Miraç Harun Talip 2019). The use of technology in science laboratories provides useful opportunities for students who can participate in high-budget, dangerous and complex experiments which are difficult to realize (Akçayır, Alçayır, Pektaş & Ocak, 2016).

In order to give students the tools they need to succeed in the modern world of science and technology, the Federal Government of Nigeria, emphasizes the importance of science education which is the cornerstone of any country's technological advancement and taught at all educational levels thereby making it mandatory at both primary and junior secondary schools. As a discipline, Science covers a wide range of areas such as biology, chemistry, and physics. In schools it can be taught as a combined subject as it is in elementary school or as a subject matter class as it is in later years, like biology. Bichi (2019) highlights that "At tertiary level, biology is one of the important subjects that formed part of the requirement for admission especially in pure and social sciences programs and it is part of general studies (science technology and society) for students in many fields of studies in Nigerian colleges of education, polytechnics and universities". However, within the realm of science education, particularly in biology, effectively teaching complex and often abstract concepts like pollution is crucial for fostering environmental literacy. While various pedagogical strategies are employed, physical field trips strategy stands out as a powerful tool for connecting theoretical knowledge with real-world phenomena. field trips allow students to engage directly with their environment, observing phenomena firsthand and fostering a deeper understanding of intricate concepts such as the causes, impacts, and mitigation of pollution (Sussan & Ebele, 2021). The authors emphasize that

such direct engagement can make abstract environmental concepts more meaningful for students.

Lawal (2023) assert that, field trip method can indirectly improve students' cognitive processes and thinking skills leading to a better understanding of concrete biology concepts. Also the implementation of teaching learning using this method is also seen to be fundamental to the success of educational development goals." Students truly need to interact with their surroundings to see, for example, the effects of pollution in real habitats and examine them, enabling them to grasp these abstract environmental issues more comprehensively (Behrendt & Franklin, 2014). However, despite their clear pedagogical value, physical field trips are often troubled with significant restrictions. As noted by Whitesell (2016), "teachers admit that there are many obstacles that disallow them from taking their classes on field trips including geographic, financial, logistical, time constraints and safety". Given these multifaceted constraints, finding suitable alternatives is unavoidable, thus using a virtual field trip to assist field trip approaches can be a logical one.

Captivating the 21st-century learner is a challenge, one that can be approached with the integration of various technologies to grasp the learner's interest. Virtual Field Trips (VFT) are one of such technology that has been integrated into the classroom. It is a guided exploration through the World Wide Web that organizes a collection of pre-screened, thematically based web pages into a structured online learning experience. (Foley,2017). According to Khotima, Krisnawati and Budi (2021), Virtual field trip (VFT) is a collection of technology-based resources used together to give students the learning experiences gained from an actual field trip. Newsome (2013), defined Virtual Field Trip as alive interactive program taught by a content provider to a classroom through the use of video conferencing technology. However, Lawal (2023), believe that VTFs are used both as a supplement to field trips as well as to provide an alternative when an actual field trip experience is not possible. Similarly, Zentis (2010), reported that VFTs can be an alternative or complementary to field activities because they are able to simulate the realities of the "outside" world in the classroom.

Also Opalewski and O'Leary, 2019 found that, "many cultural institutions utilize technology to provide distance learning opportunities or virtual field trips for students". "When used effectively, technology can open students to new experiences and places and many of the obstacles that teachers face with

a traditional field trip no longer apply". Teachers do not need to worry about money, getting permission, scheduling chaperones, taking medical risks, or skipping out on important classroom instruction time. Thus, when tradition field trips are not possible, virtual field trips offer a viable alternative. Technology empowers educators to offer novel learning experiences, facilitating connections with diverse individuals and locations through tools like videoconferencing and internet resources (Zanetis, 2010). The potential advantages of virtual environments, particularly in Biology education, are substantial in today's digital age. As technological tools such as educational games, online simulations, and virtual learning environments become increasingly prevalent, there's a growing need for educational researchers to deeply investigate their impact on learning outcomes (Mahya, 2017).

Another variable of concern in this study is the retention of students towards virtual field trip strategy. Retention is a key construct that most classroom teachers strive to maximize among their students. Student retention in biology hinges on a complex interplay of factors influencing how effectively students remember and apply biological concepts. Andrew and Sanjay (2012) defined retention as the ability of a learner to communicate to others repeatedly and overtime what he /she have learnt and how he/she has come about the results. the authors believe that, the most important thing about learning is retaining the acquired knowledge for future use. This is particularly true in science education, especially biology, where the primary goal is to equip students with a lasting understanding of the natural world. This understanding goes beyond simply being able to recall fact on exams. However, to be able to measure retention, a test has to be conducted on the learner to know if the material learnt are retained and can be remembered and reproduced. Biology is not a subject which can be learnt by mere memorization through rote learning. It is a known fact that the ability to remember takes place more effectively when experiences are passed across to the learner via an appropriate instructional or teaching method.

Statement of the problem

Environmental education is a vital component of sustainable development, enabling individuals to understand the intricate relationships between human systems and the natural environment, and to make informed decisions about environmental issues (UNESCO, 2021). However, the insecurity challenges in Zamfara State, Nigeria, have severely disrupted the education sector, making

it impossible to organize physical field trip, which are essential for hands-on learning experiences in environmental education (Balarabe, 2025), As a result, teachers are forced to rely on traditional teaching methods, which have been found to be ineffective in teaching abstract concepts like pollution. Traditional teaching methods often prioritize rote memorization and lectures, neglecting the development of critical thinking and problem-solving skills (Ugwu, Akpanke, 2024). Given the limitations of traditional teaching methods and the inaccessibility of physical field trip, there is a need to explore alternative approaches to teaching environmental concepts. This study aims to investigate the effectiveness of virtual field trip compared to traditional field trip (where possible) and traditional teaching methods on secondary school student performance and retention of pollution concepts, with a view to identifying a viable solution to improve environmental education in Zamfara State.

Research objectives

The aim of this study is to compare the effectiveness of virtual and physical field trips on secondary school student's performance and retention of pollution concept in Zamfara state, Nigeria. Specifically, the study was set to:

1. Compare the mean performance scores of secondary school students taught pollution concept using virtual field trip and those taught with physical field trips in Zamfara State.

2. Compare the mean retention scores of secondary school students taught pollution concept using virtual field trip and those taught with physical field trips in Zamfara State.

Research Questions

The following research questions were stated to guide the study:

1. What is the difference in the mean performance scores of secondary school students taught pollution concept using traditional field trip and those taught with virtual field trip in Zamfara State?

2. What is the difference in the mean retention scores of secondary school students taught pollution concept using virtual field trips and those taught with physical field trip in Zamfara State?

Research Hypotheses

Based on the research questions raised for this study, the following hypothesis would be tested at 0.05 level significance.

Ho_1 There is no significance differences in the performance scores of secondary school students taught using virtual field trips and those taught with physical field trips strategy in Zamfara State.

Ho_2 There is no significance difference in the retention scores of secondary school students taught pollution concepts using virtual field trips and those taught with physical field trips strategy in Zamfara State.

Methodology

The study adopted quasi experimental design, involving experimental and control groups. The population of the study consists of 806 SS 1 biology students from 8 science secondary schools in Zamfara State, comprising 658 boys and 148 girls. A purposive sampling technique was used to obtain two schools with comparable characteristics. A total of 102 students were obtained from the 2 intact classes selected. The instruments used for data collection are: Pollution Performance Test (PPT) and Pollution Retention Test (PRT). Pollution Retention Test (PRT) was the reshuffled PPT and was used as post-posttest. The instruments was validated by one experienced biology teacher and one test and measurement expert.A reliability coefficient of 0.76 and 0.80 were obtained for alternative A and B respectively after pilot study. The statistical tools used for data analyses include Mean and Standard Deviations, independent t-test.

Results

Research Question One

What is the difference in the mean performance of students taught pollution using virtual and those taught using physical field trips? The result of the analysis is presented in Table1.

Table 1: Means and Standard Deviation on achievement Scores of Students taught Pollution using Virtual and those taught using Physical Field Trips

Treatment	N	Mean	Std. Deviation	Mean Difference
Virtual Field Trip	52	54.0192	17.88470	

						11.37923
Physical Field Trip	50	42.6400	18.42554			
Total	102					

Source: field work, 2025

Table 1 shows the average scores (mean) and how spread out the scores were (standard deviation) for students who learned about pollution in two different ways through virtual field trips and through physical field trips. The results show that, students who used virtual field trips had an average score of 54.02, while those who went on physical field trips had an average score of 42.64. This means that, on average, students who learned through virtual field trips scored about 11.38 points higher than those who learned through physical field trips. The standard deviation values (17.88 for virtual and 18.43 for physical) show that in both groups, students' scores varied widely, meaning some students scored much higher or much lower than the average. In simple terms, the data suggests that virtual field trips helped students understand pollution better and performed better in the test compared to physical field trips.

Null Hypothesis One

There is no significant difference in the mean performance score of students taught pollution using virtual and those taught using physical field trips. This null hypothesis was tested using inferential statistics of independent sample T-test for post-test scores of the experimental and control groups. The result of the analysis is presented in Table 2.

Table 2: Summary of Independent Sample T-test on performance Scores of Students taught Pollution using Virtual and those taught using Physical Field Trips.

Treatment	N	Mean	SD	df	F	P-value	Decision
Virtual Field Trip	52	54.0192	17.88470				
				1	.424	0.002	Reject HO
Physical Field Trip	50	42.6400	18.42554				
Total	102						

Source: Field work, 2025

Table 2 presents the results of an Independent Sample T-test, which was used to check if the difference in scores between students taught pollution through virtual field trips and those taught through physical field trips was significant. The average score for the virtual field trip group was 54.02, while the average score for the physical field trip group was 42.64. The statistical test shows a p-value of 0.002, which is less than 0.05. This means the difference between the two groups is statistically significant. In simple terms, this result confirms that students who learned through virtual field trips performed significantly better

in their performance test on pollution than students who learned through physical field trips.

Research Question Two

What is the difference in the Retention ability of students taught pollution using virtual and those taught using physical field trips? The result of the analysis is presented in Table 3.

Table 3: Means and Standard Deviation on Retention ability of Students taught Pollution using Virtual and those taught using Physical Field Trips

Treatment	N	Mean	Std. Deviation	Mean Difference
Virtual Field Trip	52	84.1346	14.44127	6.94538
Physical Field Trip	50	91.0800	14.07827	
Total	102			

Source: Field work, 2025

Table 3 shows the average retention scores of students who learned about pollution through virtual field trips and those who learned through physical field trips. Retention here means how much the students were able to remember after the lesson. Students in the virtual field trip group had an average score of 84.13, while those in the physical field trip group had an average score of 91.08. This means the physical field trip group remembered slightly more of what they learned, with a difference of about 6.95 points in their favor. However, both groups had relatively high retention scores, showing that both teaching methods were effective in helping students remember what they were taught. The standard deviations (14.44 for virtual and 14.08 for physical) show that the spread of scores within each group was similar. In simple terms: While virtual field trips helped students learn well, physical field trips gave them a slight advantage in remembering the content over time.

Null Hypothesis Two

There is no significant difference in the Retention ability of students taught pollution using virtual and those taught using physical field trips. This null hypothesis was tested using inferential statistics of independent sample T-test for post-test scores of the experimental and control groups. The result of the analysis is presented in Table 4.

Table 4: Summary of Independent Sample T-test on Retention ability of Students taught Pollution using Virtual and those taught using Physical Field Trips

Treatment	N	Mean	SD	df	F	P-value	Decision
Virtual Field Trip	52	84.1346	14.44127				
				1	2.615	0.016	Reject HO
Physical Field Trip	50	91.0800	14.07827				
Total	102						

Source: Field work, 2025

Table 4 presents the results of the Independent Samples t-test comparing the retention ability of students taught pollution using virtual field trips and those taught using physical field trips. The mean retention score for the virtual field trip group was 84.13, while the physical field trip group had a higher mean score of 91.08. The p-value obtained was 0.016, which is less than the 0.05 significance level. This means that the difference in retention between the two groups is statistically significant. In other words, students who went on physical field trips were able to remember more of what they learned compared to those who participated in virtual field trips. In simple terms: Both groups remembered a lot, but physical field trips clearly gave students a stronger memory of the lesson, and this difference was not just by chance it is real and meaningful.

Discussion

The discussion of results of this study is based on the findings of this study. The finding from research question one revealed that students taught pollution concepts using Virtual field trip performed better than their counterparts taught using a physical teaching approach. This superior performance can be attributed to several factors. For example, virtual trips provide a highly controlled and focused learning environment, free from the logistical challenges of physical trips, such as travel time, weather, or on-site distractions. This allows students to concentrate fully on the specific learning objectives. Virtual trips can also be manipulated to highlight key concepts or be replayed as needed, ensuring all students grasp complex ideas at their own pace. These findings align with Babson (2025), who reported a similar increase in students' performance using virtual field trips. This also conforms with the findings of Suleiman (2024); Thelma *et al.,* (2024) and Sanyoy (2018) who reported that application of virtual reality technology in biology is more effective than the use of conventional teaching method, the authors added that VRTs increases knowledge of the topic promote active experience, rather than just passive information as it is done in conventional learning.

Additionally, as some researchers have pointed out, the ability to safely visit hazardous or distant locations virtually allows for a wider range of educational experiences, which can also contribute to improved student outcomes (Harris and Osman, 2015). This superior performance is likely attributable to the unique opportunities VFTs afford, such as enabling students to explore geographically distant environments like mangrove ecosystems. The author added that, the use of VFT could provide an opportunity for students to explore the mangrove ecosystem not in their area, sees a graphical display and video clearly which help to improve their achievement in the topic of Colonization and Succession in Mangrove Ecosystems. Harris and Osman findings gains further support from the work of Karl (2014) who found that, while VFT appears to be a successful and innovative use of technology in the classroom, it also has direct cause of students' academic improvement. The positive impact of virtual learning environments on student achievement in biology is also consistently demonstrated by Gambari', Obilodan and Kawu, work (2017) who reveals that "students exposed to physics practical's using a virtual laboratory package performed better than those with conventional laboratory methods. However, beyond academic gains, the convenience and flexibility offered by virtual learning platforms are significant advantages. These aspects of VFTs not only facilitate access to otherwise inaccessible content but also empower students with greater autonomy in their learning journey, further reinforcing their pedagogical value.

The finding from research question two revealed that students taught pollution concepts using traditional field trips strategy retained retained the pollution concept better. This aligns with the principles of experiential learning and multisensory engagement. The tangible, real-world experience of a physical field trip allows for a deeper and more durable memory formation. The higher retention score observed in the traditional field trip aligns with a substantial body of literature on experiential learning. Researchers such as Ahmad (2014); Emmanuel, Josiah, and Samuel (2014); found that students taught with field trips instruction retained knowledge better than their counterparts in the control groups. This also supported by the work of Babson (2025); Yaki, Babagana, and Abubakar (2021); Mahmud, Ismail, and Ibrahim (2022); and Ejeh et al, (2021) whose findings revealed that field trip teaching strategies aid in knowledge retention.

Implication: The findings suggest that while virtual field trips can improve immediate understanding and access, physical, hands-on experiences are crucial for deep, long-term learning. This implies that virtual field trips should not fully replace traditional methods. Instead, educators should consider a blended approach, using virtual trips for initial engagement or to access hard-to-reach places, but following up with real-world, physical activities to reinforce and solidify learning whenever conditions, like security, allow for traditional field trips.

Limitations: Despite these results, this study is limited by the study's short duration. The research only assessed learning over a limited period, so it is unknown if the retention benefits of traditional field trips would last for a longer time. Also, this study was confined to a single topic, the pollution concept, which means the results may not be applicable to other, more hands-on STEM subjects.

Future research: Future research should conduct longitudinal studies to see if the retention benefits of traditional field trips last over time. Researchers could also investigate a blended approach, examining whether a combination of virtual trips for initial engagement and traditional trips for hands-on experience could yield even better learning outcomes. Furthermore, future studies should explore the effectiveness of virtual trips across a wider range of STEM subjects and with a larger, more diverse student population to increase the generalizability of the findings.

Conclusion

The results of this research highlight that neither virtual nor traditional field trips are a standalone solution. Virtual field trips are a powerful tool for promoting equity and ensuring educational access, especially when physical travel is unsafe due to insecurity. At the same time, the superior long-term retention from traditional trips confirms the value of hands-on, real-world experiences. This suggests that the most effective strategy is a blended approach, especially when teaching subjects that require environmental education such as pollution, whenever it is safe and possible to do so.

Recommendations

Based on the foregoing conclusion, the following recommendations were made:

1. State government and stakeholders should endeavour to equip all secondary schools within the state with resources needed for virtual learning environment.

2. Teachers should try to incorporate virtual learning instruction alongside the physical field trips strategy in teaching of pollution concepts.

3. Workshops should be organizes for secondary school teachers to be enlightened on the relevance of entering into virtual learning.

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Impact of Digital Learning Tools on Students' Motivation and Academic Performance in Physics among Senior Secondary School in Katsina Zonal Education Quality Assurance

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Abstract

This study examines the impact of digital learning tools on students' motivation and academic performance in physics among senior secondary school in Katsina zonal education quality assurance, Katsina state, Nigeria. It established four objectives and research questions, and tested four hypotheses at a significance level of 0.05. A sample of 113 students was selected from a population of 17,572 SSII students, consisting of 10,258 male and 7,314 female students from public schools in the Katsina Zonal Education Quality Assurance. The research used a quasi-experimental design with instruments such as the Physics Performance Test (PPT) and Physics Motivation Questionnaire, which had validity and reliability coefficients of 0.897 and 0.753, respectively. Descriptive statistics (mean and standard deviation) were used to analyze the research questions, while inferential statistics (independent t-test and Regression Analysis) tested the hypotheses at α = 0.05. The results showed a significant difference in performance between students taught physics via Digital learning tools and those taught with the traditional method. The study recommends the government should provide computer, projectors, and internet access in schools to support digital learning and teachers should combine normal classroom teaching with digital method to help students learn better.

Keywords*:* Academic performance, Digital learning tools, Motivation. Physics, Gender

Introduction

The rapid advancement of information and communication technologies (ICT) has significantly transformed the educational landscape worldwide. Digital learning tools ranging from interactive multimedia, educational software, online platforms, to mobile learning applications are now integrated into classrooms to enhance teaching and learning. These technologies offer new opportunities to deliver content, support differentiated instruction, and provide engaging and interactive learning experiences (Ghavifekr & Rosdy, 2015).

Digital learning tools refer to technology-based resources used to enhance teaching and learning. These include educational software, mobile learning apps, virtual simulations, learning management systems (LMS), video tutorials, and interactive whiteboards. These tools aim to facilitate learner-centered environments, promote collaboration, and provide multimedia content to support diverse learning needs (Ghavifekr & Rosdy, 2015). The adoption of these tools is rooted in the belief that technology can bridge gaps in accessibility, enhance engagement, and improve instructional delivery.

According to Thoms et al. (2023), digital technologies bridge the gap between human perception and physical reality, enabling students to explore phenomena that are otherwise inaccessible due to scale, speed, or invisibility such as atomic interactions or electromagnetic radiation. This capability is particularly vital in physics, where traditional teaching methods often fall short in conveying complex ideas effectively.

One of the most critical variables in student learning is motivation. More recent evidence showing reciprocal links between task interest, self-efficacy, and performance (Nuutila et al. (2020). Traditional instructional methods, often teacher-centered, may fail to sustain students' interest, especially in a digital generation that is accustomed to interactive and multimedia-rich environments. Digital learning tools have been shown to enhance student motivation by providing interactive and immersive experiences, with augmented reality applications in particular helping students connect abstract concepts to physical reality (Thoms, Lee, & Chung, 2023).

Student motivation refers to the internal drive or external stimuli that influence a learner’s engagement, persistence, and effort in academic activities. Motivation remains a critical factor in student learning. According to Nuutila et al. (2020), task interest, self-efficacy, and performance are interrelated and

reciprocally influential, underscoring the importance of strategies that sustain learners' motivation.

In educational settings, motivation is critical as it significantly affects students' willingness to learn, effort levels, and academic success.

Motivation is a critical factor in academic success, particularly in subjects like physics that demand abstract reasoning and problem-solving skills. Nuutila et al. (2020) found reciprocal relationships between interest, self-efficacy, and performance, suggesting that motivated students are more likely to engage deeply with content and achieve better outcomes. Digital tools can enhance motivation by making learning more interactive and personalized. For example, video-based instruction has been shown to improve retention and engagement (Noetel et al., 2021). Similarly, platforms that allow students to create and share content such as explanatory videos or digital posters foster a sense of ownership and creativity (Kulgemeyer & Peters, 2016).

Furthermore, academic performance remains a central goal in educational systems, and educators are continuously exploring innovative instructional strategies to improve it. Studies suggest that digital learning tools can support academic success by providing immediate feedback, enabling self-paced learning, and promoting critical thinking skills (Ifinedo, 2017; Noetel et al., 2021). However, the effectiveness of these tools in real classroom settings particularly in developing countries has not been conclusively established Noetel et al. (2021) Systematic review showing video-based learning significantly improves student outcomes.

Previous research has indicated that the use of digital learning tools for educational purposes can lead to improved students motivation, and academic performance. For example, a study highlighted that incorporating digital learning tools into academic courses can enhanced students' interest and learning outcomes when used effectively (Ghavifekr and Rosdy, 2015). Additionally, Ifinedo (2017) explored the use of blogs and learning management systems and reported a significant increase in student motivation and performance. Several studies have explored the impact of digital learning tools on students' academic performance. For instance, research conducted by Al-Qahtani and Higgins (2013) compared traditional, blended, and e-learning methods, concluding that digital environments significantly improved academic Performance. Yusuf and Al-Banawi (2013) discovered that students

exposed to e-learning tools demonstrated higher levels of self-directed learning and better test scores than those in conventional classrooms.

In the context of secondary education, students are expected to master foundational knowledge while also developing motivation, autonomy, and problem-solving skills. Given the increasing presence of technology in students' lives, it becomes imperative to investigate how digital tools can be leveraged to support these educational goals. This study, therefore, seeks to examine the impact of digital learning tools on students' motivation and academic performance in secondary schools.

Statement of the Problem

Despite widespread adoption of digital learning tools in educational settings, there is limited empirical evidence on their actual impact on students' motivation and academic performance, particularly within the Nigerian secondary school context. While some educators assume these tools enhance engagement and understanding, others argue that without proper implementation and teacher training, they may become distractions or underutilized resources (Ifinedo, 2017).

Many schools invest in digital infrastructure without a clear strategy for integration into the curriculum. Moreover, few studies have systematically examined how these tools influence students' internal drive to learn or their academic outcomes. Given the growing emphasis on 21st-century learning, it is essential to evaluate whether digital learning tools truly contribute to meaningful educational improvement. Hence, this study aims to address this gap by assessing the impact of digital learning tools on student motivation and academic performance in physics among senior secondary school in Katsina zonal education quality assurance.

Objectives of the Study

The main the aim of this study is to examine the impact of digital learning tools on students' motivation and academic Performance. The specific objectives are to:

1. determine the effect of digital learning tools on students' academic Performance.

2. examine the impact of digital learning tools on students' motivation toward learning.

3. find out the impact of digital learning tools on academic performance of male and female students in physics.

4. identify the impact of digital learning tools on motivation scores of male and female students in physics.

Research Questions

This study will be guided by the following research questions:

1. what is the difference between the means performance scores of students taught physics using digital learning tools and those taught with traditional methods?

2. what is the difference between the mean motivation score of the students taught physics using digital learning tools and those taught using traditional Method?

3. What is the difference between the mean Performance scores of male and female students taught physics using digital learning tools?

4. What is the difference between the mean rank motivation score of Male and Female Students taught physics using digital learning tools?

1.5 Research Hypotheses

The following null hypotheses will be tested in the study:

$H0_1$: There is no significant difference between the mean performance score of students taught physics using digital learning tools and those taught using traditional methods.

$H0_2$: There is no significant difference between the mean motivation score of students taught physics using digital learning tools and those taught using traditional Method

$H0_3$: There is no significant difference between the mean performance scores of male and female students taught physics using digital learning tools.

$H0_4$: There is no significant difference between the mean rank interest score of Male and Female Students taught physics using digital learning tools.

Methodology

This study adopts a quasi-experimental research design using a pre-test, post-test non-equivalent control group design. This approach allows for the comparison of academic performance and motivation between students taught with digital learning tools (experimental group) and those taught with traditional methods (control group), while controlling for initial differences through pre-testing.

The study employed the quasi-experimental research design which has to do with pre-test, post-test and post posttest non-equivalent control group. This is because random assignment of subject to the experimental and control group was not allowed for the study. Instead, intact classes were used for the treatments to experimental and control groups. Pre-test was initially administered to the students in the two groups to determine the equivalency of the subjects being studied in terms of performance and interest in Physics before the treatment. The posttest was also conducted for the experimental and control groups to determine the impact of the treatment on the performance and motivation of the subjects in Physics.

The study population consisted of all 17,572 (10,258 male and 7,314 female) SSII students in the Katsina Zonal Education Quality Assurance area. The Katsina Zonal Education Quality Assurance area comprises three local government areas in Katsina State. Three methods were used to select a sample for the study, viz: the cluster, purposive and simple random sampling methods. Schools were grouped into three clusters based on local government areas, and one school from each cluster was randomly selected through balloting. This ensured the study was not limited to just one local government area, resulting in three schools being chosen. Two of these schools were purposively and randomly assigned to the experimental and control groups and labeled School A and School B for ethical reasons, purposive sampling to select schools equipped with digital learning facilities while Simple random sampling to assign students into experimental and control groups to ensure comparability. One intact SSII class was chosen from each of the groups using the simple random sampling technique, resulting in a total of 113 SSII students from the selected schools.

The experimental group was taught using a digital learning tools over a six-week period. Students used smartphones and were given internet access to engage with instructional content delivered through platforms such as Google Classroom, YouTube, WhatsApp, and Quizizz. Each lesson began with a short video explaining the topic, followed by interactive activities, quizzes, and collaborative discussions. The researcher provided a structured schedule, continuous feedback, and guidance on planning and evaluating tasks. Eight reflective learning rules were introduced to encourage respectful and active participation. Meanwhile, the control group was taught the same content using the conventional lecture method, following a predefined lesson plan. Both groups received instruction for the same duration.

Data were collected using two instruments, viz: the Physics Performance Test (PPT) and the Physics Motivation Questionnaire (PMQ). The PPT, a 30-item multiple-choice test based on modified Bloom's taxonomy, evaluated students' performance levels before and after the intervention. The PMQ, designed for Senior Secondary School II (SS II) students, measured Motivation toward physics using a four-point Likert scale, with responses rated as Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). Both instruments underwent validation by two experts and reliability testing. For the Physics Performance Test (PPT), a test-retest method was applied during the pilot testing to establish the reliability of instrument PPT. Pearson Product Moment Correlation (PPMC) statistical tool was used to calculate the reliability coefficient of the instrument and a value of (0.851) was obtained. While a split-half method was used for the Physics Motivation Questionnaire (PMQ) and Cronbach Alpha statistical tool was used to analyze the result and a reliability coefficient of (0.783) was obtained from the result of pilot test of the Physics Motivation Questionnaire. Descriptive statistics, such as mean and standard deviation, were employed to summarize data, with the mean reflecting average responses and the standard deviation indicating variability. Hypothesis one was tested using an independence t-test, while Hypothesis two was tested using the Mann-Whitney U-test. Hypothesis three and four were analyze using Analysis of Covariant (ANCOVA).

Results

a. Performance of the students taught Physics using Digital Learning Tools and those taught using lecture method

Table 1: Mean and Standard Deviation of Physics Performance Posttest Score for Experimental and Control Groups

Variable	Group	N	Mean	Std. Dev.	Mean difference
Posttest	Digital Learning Tools	45	26.27	1.839	6.296
	Traditional Method	68	19.97	3.138	

Table 1 shows that the mean performance scores of the experimental group (i.e. students taught using Digital Learning Tools) (M = 26.27, SD = 1.839) and that of control group (students taught using Traditional Method) (M = 19.97, SD = 3.138) differs by 6.296 in favor of the students taught using Digital Learning Tools. Hence the students taught using Digital Learning Tools outperformed their counterparts taught using Traditional Method. To determine whether this difference is significant or not, the scores of the two groups were subjected to analysis of t-test independence. The result is presented in Table 2.

Table 2: Summary of independence t-test Result on Performance in Physics between Experimental and Control Groups

Group	N	Mean	Std. Dev.	Df	t-value	p-value	Remark
Digital Learning Tools	45	26.27	1.839	111	12.138	0.000	Sig.
Traditional Method	68	19.97	3.138				

* Significant at $\alpha \leq 0.05$

Table 2 indicates that the difference between the mean performance scores of the students taught using Digital Learning Tools and those taught using traditional Method is significant. (t = 12.138, sig. = .000) at $p < .05$. Hence, Ho1 is rejected implying that there exists statistically significant difference between Experimental Group (i.e. students taught using Digital Learning Tools) and the Control Group (i.e. students taught using traditional Method) in favor of the students taught using Digital Learning Tools.

b. Students' Motivation taught physics using Digital Learning Tools and those taught using Traditional Method

Table 3: Mean Ranks of students' motivation Scores in Physics for the Experimental and Control Groups

	Group	N	Mean Rank	Sum of Ranks	Mean Ranks Diff.
Motivation	Digital Learning Tools	45	82.81	3726.50	42.89
	Traditional Method	68	39.92	2714.50	
	Total	113			

Table 3 showed that the difference between the mean motivation score of students taught physics using digital learning tools (N = 45, MR = 82.81) and those taught using traditional Method (N = 68, MR = 39.92) is 42.89 in favor of the students taught physics using digital learning tools. Hence, the students taught physics using digital learning tools exhibited higher motivation in physics than their counterparts taught using traditional Method. To determine whether this difference is significant or not, motivation scores of the two groups were subjected to the Mann Whitney U-test. The result is shown in Table 4.

Table 4: Mann Whitney U-Test for Comparison of Mean Ranks of motivation toward Physics Scores for Experimental and Control Groups

Group	N	Mean Rank	Sum of Ranks	**U-value**	**p-value**	**Remark**
Experimental Group	45	82.81	3726.50	Z = --6.818	0.000	Significant
Control Group	68	39.92	2714.50			
Total	113					

The Mann-Whitney U test result in Table 4 shows that the difference between the mean ranks of the Experimental and Control Groups is significant, $Z = -6.818$, $p < 0.05$. Hence, Ho2 is rejected, implying that there exists statistically significant difference in motivation towards physics between Experimental Group (i.e. students taught using digital learning tools) and the Control Group (i.e. students taught using traditional Method) in favor of the students taught using digital learning tools.

c. Performance of the Male and Female students taught Physics using Digital Learning Tools and those taught using lecture method

Table 5: Mean and Standard Deviation of Male and Female Performance Score

Variable	Group	N	Mean	Std. Dev.	Mean difference
Posttest	Male	22	26.09	1.797	0.34
	Female	23	26.43	1.903	

Table 5 shows that the mean performance scores of the male students taught using Digital Learning Tools (M = 26.09, SD = 1. 797) and that of Female (M = 26.43, SD = 1.903) differs by 0.34. Hence the students taught using digital learning tools are gender friendly. To determine whether this difference is significant or not, the scores of the two groups were subjected to analysis of Covariant ANCOVA. The result is presented in Table 6.

Table 6: Summary of ANCOVA Result on Performance in Physics between Male and Control Female students

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6.603[a]	2	3.302	.975	.385	.044
Intercept	2438.754	1	2438.754	720.325	.000	.945
Pretest	5.274	1	5.274	1.558	.219	.036
Gender	1.039	1	1.039	.307	.582	.007
Error	142.197	42	3.386			
Total	31196.000	45				
Corrected Total	148.800	44				

a. R Squared = .044 (Adjusted R Squared = -.001)

Table 6 indicates that the difference between the mean performance scores of the students taught using WhatsApp and those taught using Lecture Method is significant. (1, 2) = 0.307 $p \geq .05$. Hence, Ho_4 is retained implying that there no statistically significant difference between male and female.

d. Male and female Students' Motivation taught physics using Digital Learning Tools

Table 7: Mean Ranks of male and female students' motivation Scores in Physics for the Experimental

	Gender	N	Mean Rank	Sum of Ranks	Mean Ranks Diff.
Motivation	Male	22	24.32	535.00	2.58
	Female	23	21.74	500.00	
	Total	45			

Table 7 showed that the difference between the mean rank of motivation score of male students taught physics is (N = 22, MR = 24.32) and that of male students (N = 23, MR = 21.74) is 2.58 in favor of the male students. Hence, the male students taught physics using digital learning tools exhibited higher motivation in physics than female. To determine whether this difference is significant or not, motivation scores of the two scores were subjected to the Mann Whitney U-test. The result is shown in Table 8.

Table 8: Mann Whitney U-Test for Comparison of Mean Ranks of male and female student's motivation toward Physics Scores for Experimental

Group	N	Mean Rank	Sum of Ranks	U-value	p-value	Remark
Male	22	24.32	535.00			
Female	23	21.74	500.00	Z = --0.660	0.510	Not Significant
Total	**45**					

The Mann-Whitney U test result in Table 8 shows that the difference between the mean ranks of the Male and Female students is not significant, $Z = -0.660$, $p \geq 0.05$. Hence, Ho4 is retained, implying that there no statistically significant difference in motivation towards physics between male and female students.

Discussion

This study set out to investigate how digital learning tools affect students' motivation and academic performance in physics among senior secondary school students in Katsina. The findings show that students taught with digital learning tools performed significantly better than those taught with the traditional lecture method. This outcome suggests that digital platforms can provide richer, more engaging experiences that help learners grasp difficult physics concepts more effectively. This finding echoes earlier research by Ghavifekr and Rosdy (2015), who highlighted how technology integration enhances teaching and learning, as well as Al-Qahtani and Higgins (2013), who demonstrated that blended and e-learning approaches significantly boost students' academic achievement.

Another key finding was the higher motivation levels observed among students who engaged with digital tools compared to their peers in traditional classrooms. This result supports Ryan and Deci's (2000) self-determination theory, which emphasizes motivation as a driving force behind learning and persistence. It also resonates with the work of Noetel et al. (2021), who showed that video-based instruction can significantly enhance student

engagement and retention, and Ifinedo (2017), who reported that digital platforms such as blogs and learning management systems strengthen both motivation and academic outcomes.

Interestingly, the study also revealed that digital learning tools are gender-friendly. No significant difference was found between male and female students' performance or motivation. This result suggests that technology provides an inclusive environment that supports learning equally across genders. The finding is consistent with Yusuf and Al-Banawi (2013), who found that e-learning fosters self-directed learning without gender bias. Similarly, Nuutila et al. (2020) emphasized that motivation, interest, and performance are interrelated factors that remain consistent across different student groups.

Finally, the positive relationship identified between students' motivation and their performance reinforces the idea that motivated learners are more likely to excel academically. Digital tools seem to provide the conditions necessary for both motivation and performance to flourish, as supported by Kulgemeyer and Peters (2016), who highlighted how digital platforms foster creativity, ownership, and deeper engagement in learning.

Conclusion

The study concludes that digital learning tools significantly improve students' academic performance and motivation in physics compared to traditional teaching methods. These tools not only make learning more interactive and engaging but also create an inclusive environment where both male and female students benefit equally. Furthermore, the strong link between motivation and performance underscores the importance of cultivating student interest through innovative digital strategies. Overall, the study affirms that digital learning tools are effective in promoting better learning outcomes in physics and should be embraced in secondary education.

Recommendations

1. Teachers should incorporate digital tools into their teaching practices to make physics lessons more engaging and effective.

2. Governments and educational stakeholders should ensure schools are equipped with essential facilities such as projectors, computers, internet connectivity, and digital applications.

3. Regular training should be provided to teachers on how to effectively integrate digital tools into classroom teaching.

4. Schools should guarantee that both male and female students have equal opportunities to access and use digital resources.

5. Educational policymakers should prioritize ICT-driven instruction in secondary schools to meet the demands of 21st-century learning.

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School Values and Verbal Abusive Tendencies among Secondary School Students in Akwa Ibom South Senatorial District, Nigeria

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Abstract

The study aimed at determining the relationship between school values and verbal abusive tendencies of secondary school students in Akwa Ibom South Senatorial District, Nigeria. Two purposes of the study, two research questions and eight hypotheses guided the study. The study adopted the correlational research design. The population of the study comprised all the 12,400 senior secondary two (SS2) students in the 98 public secondary schools in Akwa Ibom South Senatorial District. A sample size of 1,240 senior secondary two (SS2) students which represents 10 percent of the study population was selected for the study using multi-stage sampling procedure. A total number of 4 sampled Local Government Areas, 28 sampled schools as well as 20 percent of Senior Secondary 2 students per school were selected for the study using balloting method of random sampling. A self-structured questionnaire entitled "School values and Abusive Tendencies of Students Questionnaire (SVATSQ)" was used for data collection. To establish the reliability of the SVATSQ, data were subjected to test of correlation and Cronbach Alpha statistics was applied for test of internal consistency of the instrument, which yielded the overall reliability index of 0.76 and 0.89 for the independent and dependent variables respectively. Data generated was analyzed using Pearson Product Moment Correlation (PPMC) statistics, and the findings showed a very high positive and significant relationship between self-discipline, humility and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District. The findings further revealed a high positive and significant relationship between social confidence, obedience and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District. Conclusion was drawn from the research findings while the researcher recommends among other things that, parents should maintain a sense of dignity in the family by addressing members with a polite, cheerful and amiable voice so that the young can speak to others with dignity and respect while in school.

Keywords*:* Values, Abusive, Tendencies, Social-Confidence, Obedience

Introduction

Effective and critical ways for students to stop abusive behaviour is by having their ability to say "no" to every form of abuse even if pressure by others. According to Omidullah and Javed (2020), social confidence of students stems from faith in one's abilities and respect for oneself as well as respect for others. To build social confidence, a student needs to be aware of his strengths and weaknesses, and set the right for himself and others. According to Crocker and Park (2014) social confidence not only inspires one towards a better social and work space, but also influence students behaviour to others in the school. Lack of social confidence leaves one confused, indecisive, and weak. Even with intelligence and academic grades, a student might fail to make positive behavioural impact when associating with schoolmates.

According to Miller (2010), social confidence is the willingness to take a stand in defense of principles or convictions even when others do not. Taking moral action requires one to know what the 'right' judgment entails, as well as the fortitude to stand up in the face of adversarial conditions, requiring a sufficient level of moral courage, to overcome perceived threats while pursuing a moral purpose. Social confidence occurs when students assume responsibilities or undertake moral course in the face of social ostracism. Such confidence is needful for students to overcome fear and stand firm towards maintaining ethical standard when pressured by school mates to be involved in abusive behaviour.

However, Oh and Hazler (2009) observed that most times, students may decide not to report violent behaviour to schools staff out of fear of retaliation and social rejection for turning down other students. Such student could be regarded as having low social-confidence. Social confidence is the quality that enables a person to control fear in the face of danger, pains among others. Parents are expected to teach students to be courageous when faced with challenging situations (a condition which demands that they should do what is right and not otherwise). According to Mohammed and Mahmud (2014), many students resort to abusive behaviour because they lack confidence in standing for what is right. Rather, most students often choose to follow the crowd and do what is bad.

Karimi and Saadatmand (2014) described social confidence as the beliefs or trust that a student has in performing something successfully. Rubio (2007) argued that due to low social confidence many psychological barriers such as

feeling of insecurity, fearfulness, having anxiety, and feeling yourself apart from the society are possible barriers that may arise for a student during the class which can adversely affects the performance of individual. They can consequently be leading an individual student to be distracted from the learning process. In addition, Palavan (2017) stated that poor social confidence of students can lead to poor motivation towards learning and absenteeism. Such students mostly move out of the school in mufti with the intent of causing problems with fellow students and teacher.

Social confidence is not hereditary but learned from parents and teachers. It often needs to be developed and nurtured. As noted by the author, the first step towards developing social confidence is to set achievable goals and approach them on a priority basis. Once the taste for good behaviour is developed, social confidence come automatically, along with hunger to behave in the right direction for bigger accomplishments and more recognition. The second aspect as noted by the author has a thorough knowledge about how to behave with people to avoid failure. Bad habits and shortcomings need to be identified and arrested. One has to consciously project his strengths such that they play a vital role in the social space as compared to his weaknesses. A student needs to be pleasant in terms of communication, appearance, manners and body language to ensure that other students are comfortable in the relationship.

Social confidence is the same in all areas of a person's life. It is possible that an individual be very confident in one area of life and less confident in some other areas of life. Wright (2009) stated that less confident students usually experience fearfulness, become pessimistic having no vision for life, feel insecure and live to make others happy rather than themselves. They are not ambitious, goal oriented, and have a real vision of life, and are always reluctant in reacting positively to challenges.

Social confidence is an individual's sense of having choice in initiating and regulating good actions. Social confidence reflects autonomy in the initiation and continuation of work behaviours and processes. Goals that are selected with confidence are well-internalized and autonomous. Students who have social confidence will be able to initiate and regulate personal behaviour by having control over what they will do, putting increase effort towards performance of particular task perceived as morally promoted. The lack of social confidence in students may not only create problem for students but for the school institutions.

Most of the abusive behaviour of students in educational system is due to low social confidence. As noted by Norman and Hyland (2013), most students behave abusively to other students because they could not withstand the challenges of friends who are abuser. According to Benabou and Tirole (2012), social confidence is very effective in motivating humans and can lead to changing human's behaviour. It is very necessary for a student to take risks and engage in the learning activities. Kanza (2016) noted that students who have social confidence are always carried away by the influence of friends who lack abilities and competent in working hard to achieve expected academic goals. The author added that when children move out of the family to school and the community at large, they begin to form attachments and friendships emerge through play. At this stage, children begin to think like their friends and begin to see that there are values, opinions and rules besides those that are set by their parents.

Chauhan (2010) stated that peer group has significant influence on the social confidence of adolescent. This is because adolescents are likely to do the same as their closest friends and will emulate the behaviour through observation and imitation. This means that students whose friends are abusers are most likely to become victims of abusive behaviour. The attachment to the peer group often overpowers the adolescent learner's to behave the way group members have. It is in such group that young people feel accepted and feel free to speak of things important to them and the groups provide the opportunity for learning specific skills that may not be available in other social relationships (Dewey, 2008). As noted by Worth (2011), people frequently followed the majority judgement, even when the majority is wrong. The author further noted that students often accept the abusive conduct of schoolmates just for the desire to achieve a sense of security. Any unwillingness to be influenced carries with it the risk of social rejection and this is what young people fear most. This is one of the most reasons why secondary school students in standing their grounds in rejecting abusive conducts display by their schoolmates.

According to Steinberg and Chung (2008), students lose social confidence in fighting against abusive behaviour because of their attachment with friends rather than upholding the moral values taught by their parents. The author added that young ones begin to depend on their peer for acceptance rather than their parents during adolescence. Rugg (2013) pointed out that when children are not properly trained on how to maintain social confidence in challenge

situations, they would likely follow the principles of their friends whom they formed relationship. If students spend time with abusive or aggressive peers, such students would like to engage in such behaviour as well.

Functionally, learning is a set of changes which are brought to the behaviour of a person resulting from the experiences done by a human. Social confidence can be lowered due to students' anxiety, self-insecurity, fear and feeling of being apart from the social group. As noted by De-Houwer *et al.* (2013), a student who has low social confidence can be influenced by peers to involve in school property vandalism, bullying, fighting, among others so as to create peer acceptance. This means that social confidence can lead to changing human's behaviour. For example, Berkowitz (2013) observed that a large proportion of students are bullies, victims of bullying and those who are not involved in bullying at schools. However, the authors added that while some students fail to attend school due to fear of bullying, most students often participate in bullying others because they observed their friend doing same. Oh and Hazler (2009) stated that vast majority of students are usually reported taking supportive action and participating in violent behaviour such as bullying, fighting, and sexual abuse in other to gains friend recognition and for fear of reprisal. Berkowitz (2013) supported that most students are active participant in social architecture of school violence because of low social confidence in taking solid stand on rejecting behaviours that are socially abhorred.

Another serious school factor is obedience. Obedience is considered one of the most important factors that lead to conformity to school rules and regulations which predict academic success. Obedience in this context is that modification that is manifested by carrying out the instructions issued by figures that are in authority. During traditional society, obedience was considered as the foundation for unity and peaceful co-existence in the communities. Obedience was manifested in strict adherence to the directions of the elderly ones and rules made by the chiefs in the communities. Each individual born into the family was thought about the virtue of obedience and ways of displaying such virtue to people especially the elderly ones and chiefs. This shows that students, who carefully attend all their classes, concentrate on learning and obey the school rules and regulations are generally children who receive the teaching of obedience at home.

Obedience is an act of conformity to school rule and regulations, particularly rule that forbid abusive behaviour. School rules and regulations are official orders that a particular school adopts to ensure proper students' behaviour. The author noted that in all schools, unruly conducts such as physical abuse, such as punching, hitting, spitting, kicking, strangling, pushing, biting, squeezing, shoving; verbal abuse such as name calling, constant insults, shaming and humiliating students in public, nasty, hurtful sarcasm, silences, blocking, laughing or making fun of a student inappropriately among others, are highly prohibited. Students are expected to refrain from such conducts and exhibit behaviour that promote peace and mutual understanding among students.

According to Jones (2016), school rules and regulations prepare students as good citizens who become better people in adult life; to make students realize that offenders are punished which will encourage them to obey the laws of the country and to conform to accepted norms and rules of conduct; and to encourage co-operation and harmony in the society. It is noted that if the students are to respect and obey the rules and regulations of the school in shunning abusive behaviour, parents are expected to teach the young ones the importance of obedience in social life. The authors added that it is by such education that students can honour school rules and regulations by avoiding improper behaviour that can decreased students' self-esteem.

Thus, students' obedience and engagement in school activities is considered one important outcome of motivation. When students work in conformity with rules and regulations of the school, they feel pleasured, have academic self-efficacy, determine high goals, and volunteer in learning activities that would enhance positive academic achievement instead of engaging in abusive. It is also noted that student's obedience to school rules and regulations concerning avoidance of bad behaviour are the responsibility of both the parents and the teachers. Students who take active part in school activities would likely ignore abusive behaviour and work towards achievement better in learning. Finn (2009) noted that students who feel connected to school are those who usually received parental training on obedience to school rules and regulations; and are likely to demonstrate positive behaviour and attitudes, while students who feel disconnected to school are those who lack proper parental training on the important of obedience to authorities; and are more likely to demonstrate antisocial, uncivilized, and violent behaviour both in and out the school environment.

However, students' obedience or conformity to school rules and regulations refer to the actions and practices that student direct toward school and learning. It includes positive behavioural conduct among students and teachers, students' attendance and completing school activities, active participation in classes, and/or involvement in extracurricular activities. Students' level of obedience or conformity to rules guiding proper conduct is shaped by parental involvement in teaching children proper values. Students who actively adhered to school rules and regulations are always those who receive home training from their parents.

Punishment of bad behaviour is often used on students who break school rules or do not follow school regulations. Parents are expected to punish their children when they out-rightly violate the rules and principles of the family so that they will start from home and learn that disobedience to rules is usually accompanied with discipline. Such moral training can guide young ones against abusive behaviour and other form of violence. The author added that students understand that punishment can be effective way of controlling students' behaviour when it's fair and consistent. It acts as motivators to students in order to improve students' learning and behaviour in the social environment.

Students' obedience to school rules and regulation is to bring harmony and cooperation in the classroom. School rules and regulations specify what school members should do and what they should not do. According to Machumu and Kinsanga (2011), if students are properly disciplined and controlled when they behave violently and abusively to others, there will be order, peace and harmony in schools. This implies self-control, orderliness, good behaviour and obedience to school authority are imperative to create a sense of cooperation and harmony in the school. Abusive behaviour if permitted can bring about severe aggression among students which can lead to violence, strikes and other form of abuses. The consequences of physical and verbal abuse could lead to removal of the students from classroom, aggression, bullying and violence. It is noted that wide spread violation of school rules and regulations in relation to abusive behaviour can obstruct the smooth and orderly functioning of the school system.

Abusive behaviour is the use of harshly or coarsely insulting language with the intent of hurting the feelings of another person (Ngozi and Patricia, 2018). Abusive behaviour are various behaviour which may be aggressive, coercive

or controlling, destructive, harassing, intimidating, isolating, or threatening, that an abuser may use to control a domestic partner, child or other peoples. Someone who is abusive behave in cruel and violent way towards other people. It is noted that abusive behaviour can take many forms. The authors added that abusive behaviour include being violent or aggressive making threats, controlling someone's behaviour, putting them down, verbally abusing them, taking or keeping money from them and putting pressure on someone to have sex or do things they don't feel comfortable with. Verbal abuse which is very significant in this study, also known as verbal bullying is the act of directing offensive statements toward someone with the intent of causing emotional harm. Verbal abuse consists of behaviours that are non-physical, but which can still be rather damaging, such as being threatening, insulting, or humiliating toward someone. Those who are verbally abusive tend to be so because they believe it will give them more power aAbuse is the improper usage or treatment of a thing, often to unfairly or improperly gain benefit (Doyle and Timms, 2014). Abuse can come in many forms, such as: Physical or verbal maltreatment, injury, assault, violation, rape, unjust practices, crimes, or other types of aggression. Students may become abusive when they encounter frustrating situations which they believe are beyond their control.

The theory of social dominance was proposed by Sidanius and Pratto in 1999. The social dominance theory (SDT) provides insight into the verbal abusive dynamics of students. The theorists argued that the desire for power and dominance is a central motivating factor that fuels verbal abuse; and that verbal abusers use intimidation and humiliation as a means of obtaining power. The theory indicates that youths engage in verbal abuse in their attempts to gain group social dominance, and then maintain their social status through ongoing bullying. In other words, verbal bullying or abuse is used as a means of establishing and maintaining dominance. To maintain social dominance, this group would use ongoing bullying as a means of oppressing less powerful members of the class. Indeed, youth who desired dominance act aggressively and bully others to gain social status.

The relevant of this theory to this work is that it has explained the causes and effects of verbal abuse on students learning. It is observed from this theory that the urge to maintain social dominance increases the tendency of verbal abuse or bullying among students. Verbal abuse exacerbates interpersonal conflicts and results in strong, negative emotions. It is understood from the theory that higher experience of verbal abuse can result in students' use of

substances, increase attendance problems, dropping out of school and suicidal thoughts. The fear of becoming a victim of verbal bullying or abuse creates atmosphere of trepidation and mistrust that further erodes relationships and disrupts social cohesion

Statement of Problem

Verbal abuse or verbal bullying in schools is a pattern of negative behavior that is common among secondary school students in Akwa Ibom South Senatorial District. This behavior leads directly from one student to another because of an imbalance in power that aims to hurt the feelings of a weaker student. The situation is very alarming in Akwa Ibom South Senatorial District, as most students often carry out different forms of verbal abuses like labeling, yelling, scolding, spreading gossip, slandering, and rendering accusations and insulting language. Insulting expressions like "God punish you, son of a bitch, bastard, idiot, big head, cocoanut head, rubbish" among other derogatory statements are often used by students to express their annoyance over conflicting issues. Abuses are always used by students to control or maltreat recessive classmates and to disrespect their integrity, feelings, and emotions. Some students also harass fellow students, including teachers, using verbal approaches of sexual jokes. While some students derive pleasure in criticizing, insulting, or denouncing fellow students, others display acts of anger and hostility, which is a destructive form of communication intended to harm the self-concept of other persons and produce negative emotions and physical discomfort. This situation seems to be very worrisome as schools keep producing some graduates without good morals and sound ethical values, exhibiting abusive behavior tendencies that are inimical to the peaceful existence of the school and society.

Although several research studies have been carried out on abusive behavior tendencies of students, it was observed that previous studies dwell much on sexual abuse, physical abuse, psychological abuse, and domestic abuse, with little attention given to verbal abuse or verbal bullying tendencies of students in connection with school values. No empirical study has been carried out in Akwa Ibom South Senatorial District in relation to school values and abusive tendencies of students. Therefore, this research seeks to determine the relationship between school values, such as dignity, social confidence, self-discipline, obedience, humility, tolerance, empathy, and integrity, and social

confidence, and abusive tendencies of secondary school students in Akwa Ibom South Senatorial

Objective of the Study

The aim of the study is to determine the relationship between school values and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District, Nigeria. Specifically, the study sought to determine:

1. The relationship between value of human dignity and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District.
2. The relationship between family value of social confidence and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District.

Research Questions

The following research questions were raised:

1. What is the relationship between school value of social confidence and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District?

2. What relationship exists between school value of obedience and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District?

Research Hypotheses

The following research hypotheses were formulated and tested at .05 level of significance

1. There is no significant relationship between school value of social confidence and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District.
2. There is no significant relationship between school value of obedience and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District.

Methodology

The correlational research design was adopted for the study. Area of study is Akwa Ibom South Senatoria District. Akwa Ibom South Senatorial District comprises 12 local government areas, including Ikot Abasi, Mkpat Enin, Eastern Obolo, Onna, Eket, Esit Eket, Ibeno, Okobo, Oron, Udung Uko, Urue Offong/Oruko, and Mbo LGAs. The district has a substantial number of secondary schools, with over 98 schools in the entire Akwa Ibom State, The population of the study comprised all the 12,400 senior secondary two (SS2) students in the 98 public secondary schools in Akwa Ibom South Senatorial District. A sample size of 1,240 senior secondary two (SS2) students was selected for the study, using multi-stage sampling procedure. The sample size was determined based on specifications of Nwana (1995) sampling procedure which states that if the population is in many hundreds, one needs a sample size of 20 percent, but if a population is in a few thousands one needs a sample size of 10 percent and for a population of several thousands or millions, a 5 percent sample or less will be representative of the population. On this basis, the sample size of 1,240 which represents 10 percent of the study population was selected. At the first stage of the procedure, a proportion of 40 percent of local government areas (LGAs) in each of the three educational zones was selected, which gave a total of 7 sampled LGAs for the study. At the second stage, a proportion of 30 percent of secondary schools was selected in each of sampled local government areas using random sampling method which gave a total of 28 sampled schools. At the last stage, a proportion of 20 percent of students was selected from each of the schools using balloting method of random sampling, which gave a total of 1,240 sampled respondents. The selection procedure is shown in Appendix I.

A self-structured questionnaire was used to determine the opinions, attitudes, preferences and perceptions of the respondents that were used for data collection. The questionnaire name was “School values and Abusive Tendencies of Students Questionnaire (SVATSQ)”. The questionnaire had two sections. Section A contained 40 items, 5 items each on school values while section B contained a 12 items measuring students’ abusive tendencies. The SVATSQ was scored using a four point rating scale of: Strongly Agree (SA) = 4 Agree (A) = 3 Disagree = 2 Strongly Disagree (SD) = 1

The respondents were requested to give their own opinions or views to the instrument using the symbol (r). Similarly, the validated questionnaires were

subjected to appropriate trial testing to ensure its reliability. The questionnaire was face validated by three experts: one in the Sociology of Education Unit while the remaining two were from Measurement and Evaluation Unit all in the Department of Educational Foundations of Education University of Uyo. To establish the reliability of the SVATSQ questionnaire, Cronbach Alpha reliability technique was used. This yielded the reliability co-efficient of .75. Therefore, the instrument was deemed reliable for use in the study. The research instruments were administered on the respondents in their respective schools by the researcher together with two trained research assistants. Also, permission from the respective principals was sought to allow the students to participate in the study. In addition to items written on the questionnaire, verbal explanation was made to items for clarity by the students as well as research assistants who are to guide the students in responding to the items on the questionnaire. The whole exercise was to last for 60 minutes in each of the sampled schools. Data generated were analysed using Pearson Product Moment Correlation (PPMC) statistics using Statistical Package for Social Science (SPSS) software (version 25). In answering the research questions, the r-value or co-efficient value obtained was used to determine the magnitude or weight of relationship between variables while in testing of the hypotheses, the r-value was compared with the critical value so as to determine the significance of relationship between variables, all at .05 level of significance and at 1238 degree of freedom.

Results

Research Question 1: What is the relationship between social confidence and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District?

Table1: Correlation analysis of responses between social confidence and abusive tendencies of secondary school students

Variables		n	∑x ∑y	∑x2 value ∑y2	∑xy	r-value	Remark
Social Confidence (x)	1240	17067		239613			
					256492	.625	High Positive Relationship
Abusive Tendencies of Students (y)	1240	17541		256169			

Source: Field data (2025)

Result in Table1 reveals a correlation value of .625. From the decision rule, it is observed that a high positive relationship occur between social confidence and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District. The implication of this result is that students are most likely to avoid abusive words on school mates if parents built in them the tenacity to resist verbal bullying at early stage and vice versa.

Research Question 2: What relationship exists between obedience and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District?

Table 2: Correlation analysis of responses between obedience and abusive tendencies of secondary school students

Variables	**n**	**∑x** **∑y**	**∑x²** **∑y²**	**∑xy**	**r-value**	**Remark**
Obedience (x)	1240	17137	241175			
				244883	.665	High Positive Relationship
Abusive Tendencies of Students (y)	1240	17541	256169			

Source: Field data (2021)

Result in Table 2 reveals a correlation value of .665. From the decision rule, it is seen that a high positive relationship occur between obedience and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District. The implication of this result is that students are most likely to disobey school rules and regulations and utilize insulting languages in communication if parents are not exemplary on rules compliance and vice versa.

Table 3: Pearson Product Moment Correlation analysis between social confidence and abusive tendencies of secondary school students

Variables	**n**	**df**	**r-cal**	**r-crit**	**Decision**
Social Confidence (x)	1240	1238	.625*	0.196	Rejected H_o
Abusive Tendencies of Students (y)					

Significant; P<.05; Source: Field data (2025)

Table 3 shows that the calculated r-value of .625 is greater than the critical value of 0.196 at the degree of freedom of 1238 and at .05 significant levels. Hence, the null hypothesis is therefore rejected, while the alternate hypothesis is retained. This implies that there is a significant relationship between social confidence and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District.

Table 4: Pearson Product Moment Correlation analysis between obedience and abusive tendencies of secondary school students

Variables	n	df	r-cal	r-crit	Decision
Obedience (x) Abusive Tendencies of Students (y)	1240	1238	.665*	0.196	Rejected H_o

Significant; P<.05; Source: Field data (2025

Table 4 shows that the calculated r-value of .665 is greater than the critical value of 0.196 at the degree of freedom of 1238 and at .05 significant levels. Hence, the null hypothesis is therefore rejected, while the alternate hypothesis is retained. This implies that there is a significant relationship between obedience and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District.

Discussion

Social Confidence and Abusive Tendencies of Secondary School Students

Results from the research question two and hypothesis two revealed a very high positive and significant relationship between social confidence and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District. This finding is in tandem with the finding of the study conducted by Ekeh and Oladayo (2016) that, low social-confidence pushes students to be involved in abusive behaviour such as physical and verbal abuse. This finding corroborates the finding of the study conducted by Bassey and Iruoje (2016) that, lack of social confidence in resisting peer influence serve as instigator of verbal bullying among students. This is because teaching students how to protect our moral values publicly is an essential component of parents continues service. Parents must have the desire and ability to discuss ethical issues in other to awaken students' moral consciousness and awareness. This finding is also in line with that of Nitza and Lea (2018), that moral confidence help students to resist abusive and other anti-social

behaviour displayed by school mates. Therefore, it is observed that if parents nurture in children how to withstand pressure from friends in relation to abusive conducts, such children would likely be willing to confidently uphold moral standards and do away with all form of verbal bullying when provoked.

Obedience and Abusive Tendencies of Secondary School Students

Results from the research question two and hypothesis four revealed a high positive and significant relationship between obedience and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District. This finding conforms to that of Kwayu (2014), who found that students whose families were exemplary in obeying rules and regulations where more obedience to school rules than those whose parents behaviour goes against specified rules in relation to verbal victimization. Also, the finding of Al-Alwan (2014) supportively revealed that parental teaching of moral values such as obedience have significant relationship with student's adherence to school rules and regulations regarding deviant behaviour such as verbal abuse. This is because parents' attitude towards law and authority plays an important role in determining how children will perceive obedience to rules governing their behaviour and conducts in the school. It is therefore observed that following the rules at home will make students more accustomed to following the rules of the large society. Learning to respect laws and authority will help students adjust easily in school; hence avoiding abusive conducts.

Summary, Conclusion and Recommendations

The study aimed at determining the relationship between school values and abusive tendencies of secondary school students in Akwa Ibom South Senatorial District, Nigeria. Two purposes of the study, two research questions and two hypotheses guided the study. The study adopted the correlational research design. The population of the study comprised all the 12,400 senior secondary two (SS2) students in the 98 public secondary schools in Akwa Ibom South Senatorial District. A sample size of 1,240 senior secondary two (SS2) students which represents 10 percent of the study population was selected for the study using multi-stage sampling procedure. A total number of 7 sampled of LGAs, 28 sampled schools as well as 20 percent of SSS 2 students per school were selected for the study using balloting method of random sampling using self-structured questionnaire with Cronbach Alpha

reliability index of 0.76 and 0.89 and data was analysed using analysed using Pearson Product Moment Correlation.

Based on the findings of the study, the following conclusions were drawn. High social confidence of students can be enhanced if parents teach the children the benefits of maintaining ethical standard while overcoming fear or increased pressure by school mates to be involved in verbal bullying or abuse.

Also. based on the findings of the study, the following recommendations are made:

1. Teachers should endeavor to teach their children how to evaluate and control their emotions and feeling or impulses particularly when provoked, so as to avoid being easily dive into harmful situation like verbal accusations.
2. Teachers should act as significant model in obeying and respecting laws in their daily life so that young one follow similar behavioural pattern in school, especially rules that forbids abusive conducts.

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Guidance and Counselling Services and Mental Well-Being of Individuals with Special Needs in A.A. Raji Special School Sokoto

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Abstract

This study investigated the impact of guidance and counselling services on the mental well-being of individuals with special needs in senior secondary schools in Sokoto Metropolis. Two objectives and two hypotheses guided the research. The study adopted a descriptive survey design with a sample of 100 students from A.A Raji Special School through stratified random sampling. Data were collected using a structured questionnaire titled Guidance and Counselling Services and Mental Well-Being Questionnaire (GCSMWQ) and analyzed using Chi-square tests at 0.05 significance level. Findings revealed that both academic and personal counselling services significantly enhance the mental well-being of students with special needs. Academic counselling was found to reduce academic stress, improve study habits and boost performance, while personal counselling enhanced self-esteem, stress management and emotional adjustment. The study rejected both null hypotheses, confirming a positive relationship between counselling services and mental well-being. However, challenges such as inadequate trained counsellors, insufficient facilities and cultural stigma were noted. The study recommends recruiting more trained counsellors, integrating counselling into inclusive education policies and increasing awareness to reduce stigma. Adequate funding and resource allocation are essential to sustain and improve these services for learners with disabilities.

Keywords*:* Guidance and Counselling, Mental well-being & Special needs students

Introduction

Education is widely acknowledged as a powerful tool for both personal advancement and national development. However, for students with special needs, the educational experience is often complicated by challenges that go beyond academics to include emotional, psychological, and social concerns. These challenges have created a demand for structured interventions, particularly guidance and counselling services, which play an essential role in supporting students' adjustment and overall mental well-being. According to Egbochuku (2008), the introduction of guidance and counselling into Nigerian schools was designed to provide learners with assistance across academic, vocational, personal, and social domains, thereby helping them cope with the realities of school and life.

Over the years, the scope of school counselling in Nigeria has shifted significantly. Earlier models were focused largely on career guidance, but in response to broader educational and societal demands, counselling has expanded into a comprehensive and developmental framework that encompasses academic support, personal growth, and mental health (Nwachukwu, 2019). This evolution reflects a global recognition of the need to address not just the intellectual but also the psychological needs of learners.

Mental well-being, therefore, has emerged as a central concern. The World Health Organization (2020) defines mental well-being as the state in which individuals are able to realize their potential, cope with everyday stress, and contribute productively to their communities. Mental well-being refers to the state in which individuals can cope with the normal stresses of life, work productively, and contribute to their community (World Health Organization [WHO], 2020). For students with special needs, mental well-being is particularly significant because it influences their ability to engage with learning, maintain social relationships, and develop resilience against stigma and discrimination (Oladipo & Balogun, 2021). In the Nigerian context, poor access to quality educational resources, coupled with the social stigma attached to disability, often undermines the mental well-being of students with special needs (Aliyu & Umar, 2021). This highlights the urgent need for structured interventions such as guidance and counselling to provide emotional support and enhance resilience.

The term "special needs" refers to individuals whose physical, sensory, or cognitive impairments affect their ability to participate fully in educational and

social environments. Heward (2012) highlights the diversity of conditions, including visual, hearing, orthopedic, and neurological impairments. The United Nations Convention on the Rights of Persons with Disabilities (CRPD, 2016) emphasizes the need for inclusive education to remove barriers and promote equal opportunities. From a social model perspective, Oliver (2016) explains that disability results not only from impairments but from societal and environmental barriers. Hence, individuals with special needs require tailored support, including counselling, to ensure full participation in education.

Academic counselling involves helping students plan and manage their learning activities effectively, including time management, study skills, test preparation, and dealing with learning difficulties (Okeke, 2021). Research indicates that students who receive effective academic counselling demonstrate higher self-confidence, reduced exam anxiety, and improved academic performance (Eyo, Joshua, & Esuong, 2010). For students with special needs, academic counselling is essential in reducing academic pressure and providing strategies tailored to their learning challenges (Onyechi & Okere, 2021). Without such support, these students may experience heightened stress and feelings of inadequacy, which negatively affect their mental well-being (Usman & Salihu, 2019).

Personal counselling focuses on helping students deal with emotional and psychological challenges such as anxiety, low self-esteem, peer pressure, and family-related stress (Nwoye, 2017). Scholars argue that personal counselling provides a safe space for students to express their feelings, develop coping mechanisms, and build resilience (Oladele, 2022).

Several studies have linked personal counselling to improved emotional regulation, greater self-confidence, and better overall mental well-being (Obi, 2020; Adebowale & Dare, 2017). For students with special needs, personal counselling is particularly valuable because they are more likely to face stigma, isolation, and bullying, which can harm their self-concept (Okonkwo, 2020). By addressing these emotional challenges, personal counselling enhances their ability to thrive academically and socially.

Despite these benefits, researchers have highlighted several challenges undermining the effectiveness of school counselling in Nigeria. Uzor (2012) and Oladele (2022) point out that many schools lack adequately trained counsellors and the infrastructure required for effective service delivery.

Counselling units are often underfunded, and programmes remain poorly integrated into school systems. These problems are even more pronounced in northern Nigeria, particularly Sokoto Metropolis, where socio-economic limitations, cultural perceptions of disability, and a shortage of resources impede access to quality counselling services (Yakubu, 2020).

Nevertheless, empirical evidence continues to affirm the importance of guidance and counselling in improving learners' psychological outcomes. For example, Adebowale and Dare (2017) linked counselling services to reductions in anxiety, while Whiston and Sexton (2018) provided global evidence that school-based counselling has measurable impacts on mental health outcomes. These findings highlight the relevance of counselling as both a preventive and developmental service for students with special needs.

Given the unique challenges faced by learners with disabilities in Sokoto Metropolis, there is a pressing need to investigate the extent to which academic and personal counselling services contribute to their mental well-being. While earlier research has established the general benefits of counselling, there remains limited localized evidence in Sokoto. This study, therefore, seeks to address this gap by exploring how academic and personal counselling services influence the mental well-being of students with special needs in senior secondary schools within Sokoto Metropolis.

Statement of the Problem

The research problem focuses on understanding the challenges faced by individuals with special needs in relation to their mental well-being within the educational environment. Many students with physical, sensory, or intellectual impairments encounter social isolation, stigma, and restricted access to appropriate learning supports and facilities. Such barriers increase the risk of anxiety, depression and low self-esteem among affected students. Academic pressures and difficulties with transitions amplify stress when schools lack tailored academic guidance and accommodations. Furthermore, limited availability of trained counselors and inadequate counseling programs mean that students often do not receive timely psychosocial support. Parental and community misconceptions about disability can also restrict help-seeking and reinforce exclusionary attitudes. The cumulative effect of these personal, institutional and social barriers undermines students' capacity to cope, learn and participate fully in school life. Despite policies promoting inclusive

education, practical gaps in implementation and resource allocation persist, creating a disjunction between policy intent and lived experience. This study therefore seeks to investigate how guidance and counseling services provided within senior secondary schools can mitigate these challenges and support the mental well-being of students with special needs. By examining the extent and effectiveness of academic and vocational counseling provision, the research aims to identify specific service shortfalls and actionable improvements needed to enhance students' emotional resilience and academic engagement. Findings will inform school practices, policy adjustments, and strategic allocation of counseling resources soon thereafter.

Objectives of the Study

This study was guided by two specific objectives:

1. To examine the influence of academic counselling services on the mental well-being of students with special needs in Sokoto Metropolis.
2. To examine the influence of personal counselling services on the mental well-being of students with special needs in Sokoto Metropolis.

Hypotheses

The following null hypotheses were formulated and tested:

H01: There is no significant relationship between academic counselling services and the mental well-being of students with special needs.

H02: There is no significant relationship between personal counselling services and the mental well-being of students with special needs.

Methodology

The research design adopted for this study was the descriptive correlational research design. This design was considered appropriate because it allows data to be collected from a representative sample of a population and enables generalizations to be made about the entire population. The design also provides an avenue for identifying and analyzing relationships between variables. In this case, the study sought to determine the impact of guidance and counseling services on the mental well-being of individuals with special needs in senior secondary schools in Sokoto Metropolis.

The population of the study consisted of all senior secondary school students of A.A. Raji Special School in Sokoto, which caters for students with hearing impairments, visual impairments, physical impairments, and intellectual impairments. The school had a total population of 1,236 students, distributed across SS1, SS2, and SS3 classes.

A sample of 100 students was selected from the population using the stratified random sampling technique to ensure proper representation of students across gender and class levels. This method was employed to give every category of student within the population an equal chance of being selected and to minimize sampling bias.

The main instrument for data collection was a structured questionnaire developed by the researcher, titled *Guidance and Counseling Services and Mental Well-being Questionnaire (GCSMWQ)*. The validity and reliability indexes of 0.87 and 0.79 were obtained respectively.

The data analysis was carried out using inferential statistics. Chi-square (χ^2) test of independence was employed to test the formulated hypotheses at a 0.05 level of significance. This approach was suitable because it enabled the researcher to determine whether significant associations exist between guidance and counseling services and the mental well-being of individuals with special needs.

Results

The data collected through the questionnaire are presented in tables for analysis, reflecting the impact of guidance and counselling services on mental well-being of individuals with special needs in senior secondary school in Sokoto metropolis, Sokoto state Nigeria. The analysis of the data was divided into two sections: Section A focused on background variables, while Section B addressed data related to guidance and counselling services on mental well-being of individuals with special needs in senior secondary school.

Table 1: Distribution of Respondents According to Level

Gender	Frequency	Percentages (%)
Male	62	62
Female	38	38
Total	**100**	**100**

Sources: Field Work, 2025

Table 1 revealed that males made up 62% of the respondents while females made up 38%. This indicated that there were more males than females' respondents in the study. This indicates a slight male dominance in the sample.

Table 2: Distribution of Respondents According to Class Level

Class Level	Frequency	Percentages (%)
SS1	30	30
SS2	40	40
SS3	30	30
Total	**100**	**100**

Sources: Field Work, 2025

Table 2 revealed that 30 respondents, representing 30% were in SS 1. 40 respondents, representing 40% were in SS 2, while 30 respondents, representing 30% were in SS 3. This indicated that majority of the respondents were in SS 2.

Table 3: Distribution of Respondents According to Type of Special Need

Type of Special Need	**Frequency**	**Percentages (%)**
Hearing Impairment	30	30
Visual Impairment	40	40
Learning Difficulties	30	30
Total	100	100

Table 3 reveals that 30 respondents, representing 30% were Hearing Impaired, while 40 respondents, representing 40% were Visual Impairment and 30 respondents, representing 30% were Learning Difficulties. This implies that most respondents were Visual Impairment and would reflect majority in data gathered which would have salutary effects for the study in producing credible and reliable results.

Analysis of Research Objectives

Objective 1: To examine the influence of academic counselling services on the mental well-being of students with special needs

Table 4: Respondents' Opinions on Academic Counselling Services

Statement	**SA (%)**	**A (%)**	**D (%)**	**SD (%)**
Counsellors help me plan my studies effectively.	40.0	42.1	12.4	5.5
I receive guidance on preparing for examinations.	36.6	44.1	10.3	9.0
Academic counselling reduces my academic stress.	38.6	40.0	12.4	9.0
Counsellors advise me on managing my time.	34.5	42.1	13.1	10.3
I perform better in class due to counselling support.	37.2	40.7	12.4	9.7

Sources: Field Work, 2025

Most respondents agreed that academic counselling services positively support their studies. Over 75% of respondents (combining SA and A) across all items confirmed that counselling helps them plan studies, prepare for exams, manage stress, and improve performance. Only a small proportion (around 9–13%) disagreed, suggesting that academic counselling plays a significant role in reducing stress and enhancing learning among students with special needs.

Objective 2: To examine the influence of personal counselling services on the mental well-being of students with special needs

Table 5: Respondents' Opinions on Personal Counselling Services

Statement	SA (%)	A (%)	D (%)	SD (%)
Personal counselling helps me cope with stress.	41.4	40.0	10.3	8.3
I feel more confident after personal counselling.	44.1	38.6	9.0	8.3
Counsellors help me overcome low self-esteem.	42.1	41.4	9.0	7.5
I share my emotional problems with the counsellor.	38.6	39.3	11.0	11.0
Personal counselling improves my overall mental well-being.	45.5	37.2	9.0	8.3

Sources: Field Work, 2025

A large majority (over 78% of respondents) agreed that personal counselling services improved their stress management, confidence, and emotional well-being. Less than 12% disagreed, showing strong acceptance of personal counselling as a major factor in enhancing psychological resilience of students with special needs.

Hypothesis Testing

Hypothesis One (H01): There is no significant relationship between academic counselling services and the mental well-being of students with special needs

Table 6: Chi-Square Test on Academic Counselling and Mental Well-Being

Response	**Observed (O)**	**Expected (E)**	**$(O–E)^2 / E$**
Agree (SA + A)	77	50	14.58
Disagree (D + SD)	23	50	14.58
Total	100	100	29.16

Sources: Field Work, 2025

At 1.df; significant level of 0.05, critical value is 3.84.

Table 3 shows that there is a significant relationship between academic counselling services and the mental well-being of students with special needs. Therefore, the null hypothesis is rejected since the calculated value is greater than the critical value (i.e 29.16 > 3.84).

Hypothesis Two (H02): There is no significant relationship between personal counselling services and the mental well-being of students with special needs.

Table 7: Chi-Square Test on Personal Counselling and Mental Well-Being

Response	Observed (O)	Expected (E)	$(O–E)^2 / E$
Agree (SA + A)	80	50	18.00
Disagree (D + SD)	20	50	18.00
Total	100	100	36.00

Sources: *Field Work, 2025*:
@ 1.df; significant level of 0.05, critical value is 3.84.

Table 4 shows that there is a significant relationship between personal counselling services and the mental well-being of students with special needs. Therefore, the null hypothesis is rejected since the calculated value is greater than the critical value (i.e 36.00 > 3.84).

Discussion

The study revealed that both academic and personal counselling services positively and significantly influence the mental well-being of students with special needs in Sokoto Metropolis.

The results indicated that counselling helped students plan their studies, manage time, and cope with academic stress. This finding supports Okeke (2021), who noted that academic counselling reduces anxiety and enhances performance. Similarly, Eyo, Joshua, and Esuong (2010) reported that counselling improved study habits and built self-confidence. These results show that academic guidance provides practical tools for academic success and mental stability.

Personal counselling was found to enhance stress management, self-esteem, and emotional adjustment. This agrees with Adebowale and Dare (2017), who demonstrated that personal counselling reduced anxiety and promoted emotional regulation among Nigerian adolescents. Obi (2020) also emphasized its role in improving students' coping abilities. For students with special needs, this form of counselling is crucial given their higher risk of stigma, discrimination, and isolation (Okonkwo, 2020).

The findings also resonate with Whiston and Sexton (2018), who provided global evidence of counselling's impact on students' mental health. Oladipo and Balogun (2021) similarly noted that psychological well-being directly influences learning outcomes for students with disabilities. By confirming

these associations in Sokoto, this study underscores the universal importance of school counselling.

However, challenges remain. As Uzor (2012) and Yakubu (2020) observed, limited trained counsellors, inadequate infrastructure, and cultural barriers in northern Nigeria hinder effective counselling. Without addressing these systemic issues, the full benefits of counselling may not be realized.

Conclusion

This study concludes that both academic and personal counselling services play a vital role in supporting the mental well-being of students with special needs in Sokoto Metropolis. Academic counselling reduces academic pressure and fosters learning success, while personal counselling enhances emotional resilience, self-confidence, and psychological adjustment. Since both null hypotheses were rejected, the study confirms a strong, positive, and significant relationship between counselling services and mental well-being of students with special needs.

Recommendations

Drawing on the findings and the conclusions made, the following recommendations are made:

3. The schools should employ more trained counsellors and equip units with proper facilities.
4. Counselling services should be mainstreamed into inclusive education policies at both state and federal levels.
5. Parents and communities should be sensitized to reduce stigma and support children's access to counselling.
6. Government should allocate sufficient resources to sustain school counselling programmes and provide assistive tools for learners with disabilities.

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Impact of Broken Homes on Mental Wellbeing Among Undergraduate Students in Sokoto State Owned Universities: Implication for Counselling

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Abstract

The study investigated on the impact of Broken Home on mental wellbeing among undergraduate students in Sokoto state owned Universities. It employed descriptive survey design and purposive sampling was used in selecting 370 respondents from the population of 21,338 undergraduate education students across the state owned universities. Two research objectives and two hypotheses were used and an adapted questionnaire from Schultz (2013) titled, Mental Well-Being and Broken Home questionnaire (MWBBHQ) was used to collect data for the study with validity and reliability indexes of 0.87 and 0.75 respectively. The collected data were used in testing the formulated hypotheses using statistical tool of Independent Sample t-test and the results obtained stated that, moral and social factors associated with broken homes demonstrate a statistically significant effect on the mental well-being of undergraduate students in Sokoto State, Nigeria. And it was recommended that, Undergraduate students of education should be encouraged to learn healthy coping mechanisms, such as stress management, self-care, and problem-solving skills as well as prioritize physical and emotional well-being through activities like exercise, meditation, or hobbies.

Keywords*:* Broken home & Mental wellbeing

Introduction

The home is the child's first place of contact with the world. The child, as the result acquires initial education and socialization from parents and other significant persons in the homes The makeup or status of the homes has a significant role in determining how much support a student will likely receive from their homes. The worldwide data clearly show that children in broken households are likely to perform worse in university than their peers in two-parent families, even if there are numerous examples of broken homes that offer significant social, emotional, and financial support to students.

In many cultures, the stigma and social attitudes surrounding homes breakdown can further exacerbate the mental health challenges faced by undergraduate students from broken homes. The lack of support and understanding from peers, educators, and community members can contribute to feelings of isolation and shame, compounding the emotional burden of homes disruption. Mental well-being of students is a complex and multifaceted issue that requires attention from mental health professionals, educators, and policymakers. By understanding the psychological effects of parental separation and divorce on young adults, interventions and support services can be developed to address the unique needs of undergraduate students from broken homes. This background study paves the way for future research and initiatives aimed at promoting the mental well-being of young adults impacted by homes breakdown on a global scale. McLanahan, Tach, & Schneider. (2013).

Broken homes, which are characterized by the absence of one or both parents due to divorce, separation, or abandonment, have been shown to have a significant impact on the mental well-being of children and adolescents. The homes environment plays a crucial role in shaping an individual's emotional and psychological development, and disruptions in this environment can have far-reaching implications for mental health. This background study aims to explore the impact of broken homes on the mental well-being of undergraduate students in Sokoto, with a focus on the psychological effects of parental separation and divorce on this demographic setting. Numerous studies have highlighted the negative effects of broken homes on the mental well-being of children and adolescents, McLanahan, Tach, & Schneider. (2013).

In Nigeria, the prevalence of broken homes is a significant concern, with studies indicating that over 30% of households are headed by single parents

(National Population Commission, 2010). The impact of broken homes on mental wellbeing is particularly relevant in the context of undergraduate students, who may be more vulnerable to the effects of homes disruption due to their stage of development.

Children from broken homes are more likely to experience emotional disturbances, such as depression, anxiety, and behavioural problems, compared to those from intact families. The absence of one or both parents can lead to feelings of abandonment, loss, and insecurity, which can have lasting effects on a young person's emotional stability and self-esteem. Furthermore, the stress and conflict associated with parental separation or divorce can create a hostile and unpredictable home environment, leading to increased levels of chronic stress and psychological distress in children. The instability and uncertainty that often accompany broken homes can also disrupt the development of secure attachment bonds between children and their parents, leading to difficulties in forming healthy relationships and coping with stress in later life (Tenibiaje, 2011).

Dapar's 2021 study explores the significant impact of broken families on students' behavior and academic performance. The research highlights that students from broken homes often experience emotional instability, social maladjustment, and decreased academic performance. Students from broken families tend to perform poorly in academic tasks, particularly in subjects that require critical thinking and problem-solving skills. Students from broken homes often struggle with socialization, exhibiting difficulties in forming and maintaining relationships with their peers. The study found that students from broken families tend to have lower emotional intelligence, which can affect their ability to interact with others and manage their emotions (Moneva, Bantasan and Vertulfo, 2020).

The rate at which homes are broken today appears to be on the increase. Despite all the efforts the various governments, religious organizations, non-governmental organizations (NGOs) and marriage counsellors are making to promote marital stability among couples in Nigeria, the issue of broken homes still exists in the country. Literature sources reveal that students from such homes suffer emotional trauma, depression, negative self-concept and low self-esteem. In most cases, the adolescents from such homes manifest negative tendencies in school such as truancy, aggression, lack of concentration, examination malpractice, bullying, drug abuse, stealing and other vices.

Research Objectives

1. To examine the academic effects of broken homes on mental wellbeing among undergraduate students in Sokoto
2. To examine the social effects of broken homes on mental wellbeing among undergraduate students in Sokoto

Research Hypotheses

H_{O1}. There is no significant difference of moral factor of broken homes on mental wellbeing among undergraduate students in Sokoto state

H_{03}. There is no significant difference of social factor of broken homes on mental wellbeing among undergraduate students in Sokoto state

Methodology

The research design adopted for this study was descriptive correlational research design, which involves gathering information from sample under study at a single point and time. A descriptive research design is chosen in order to find out the valuable information and insights into a particular phenomenon which can inform future research, policy decision, program and serves as baseline for future research.

The population of the study consists of the entire 21,338 undergraduate education students in the state universities in Sokoto State, as presented in Table 1 below:

Table 1: Distribution of the Population of the Study

S/N	Name of school	No. of Students
1.	Sokoto State University	19,915
2.	Shehu Shagari University of Education	1,423
	Total	**21,338**

The study adopted Purposive sampling technique in choosing Three Hundred and Seventy (370) students who are from broken homes from the population of the study. Purposive sampling technique was employed due to fact that only students from broken homes are determined as respondents to the study.

Instrumentation

The instrument for data collection is adapted from Schultz (2013) titled, Mental Well-Being and Broken Home questionnaire (MWBBHQ) was used to collect data for this study. The instrument is close-ended instrument which consist of two main parts: Section A demands the participants demographic variables and Section B contains 20 items on a 4-points Likerts' types questions (ranging from 4 which means Strongly Agree to 1 which means Strongly Disagree) requires the participants to show their level of agreements with the statement in each of the items.

To ensure validity of the scale, three experts in the field of educational research were involved who served as independent judges their comments and feedbacks were used to compute the content validity index 0.87 which shows that the instrument is measuring what it is intended to measure. The original author of the instrument used Cronbach Alpha to obtain the reliability index of 0.72. the data collected were analysed using independent sample t-test in testing the already formulated hypotheses with the help of SPSS Version 20.

Results

$H0_1$ There is no significant difference of moral factor of broken homes on mental wellbeing among undergraduate students in Sokoto state.

This hypothesis was tested by subjecting the moral factor of broken homes and mental wellbeing scores of students to Independent Samples t-test analysis and the result was presented in table 2.

Table 2: Difference in moral factor of broken homes and mental wellbeing

Variables	N	Mean	Std. Deviation	*t*-Cal	*p*-Value	Decision
Moral Factor	370	3.48	.500	7.031	.000	H_0 Rejected
Mental Wellbeing	370	3.09	.935			

Result of table 4.3.1 indicates that significant difference that exists between moral factor (Mean = 3.48) and mental wellbeing (Mean = 3.09) is positive and significant, $t(369) = 7.031$, $p = .000$. Thus, since the *p*-value is less than the .05 level of significance, $H0_1$ which states that there is no significant difference of moral factor of broken homes on mental wellbeing among

undergraduate students in Sokoto state was rejected. Alternatively, moral factors associated with broken homes were established to have an effect on the mental well-being of undergraduate students in Sokoto state, Nigeria.

H0$_3$ There is no significant difference of social factor of broken homes on mental wellbeing among undergraduate students in Sokoto state.

This hypothesis was tested by subjecting the social factor of broken homes and mental wellbeing scores of students to Independent Samples t-test analysis and the result was presented in table 3.

Table 3: Difference in social factor of broken homes and mental wellbeing

Variables	N	Mean	Std. Deviation	*t*-Cal	*p*-Value	Decision
Social Factor	370	3.37	.722	4.608	.000	H_0 Rejected
Mental Wellbeing	370	3.09	.935			

Result of table 4.3.3 indicates that significant difference that exists between social factor (Mean = 3.37) and mental wellbeing (Mean = 3.09) is positive and significant, $t(369) = 4.608$, $p = .000$. Thus, since the *p*-value is less than the .05 level of significance, $H0_3$ which states that there is no significant difference of social factor of broken homes on mental wellbeing among undergraduate students in Sokoto state was rejected. Alternatively, social factors associated with broken homes were established to have an effect on the mental well-being of undergraduate students in Sokoto state, Nigeria.

Discussion

The findings of this study offer comprehensive insights into how various factors related to broken homes influence the mental wellbeing of undergraduate students in Sokoto State, Nigeria. This discussion elaborates on these relationships in light of existing research and theoretical frameworks.

Firstly, on the Moral Factors and Mental Wellbeing, the study reveals a statistically significant effect of moral factors linked to broken homes on students' mental wellbeing. This indicates that disruptions in the moral and ethical framework within the homes environment may deeply affect students' psychological health. Moral development plays a crucial role in shaping how individuals interpret and cope with stressful life events. The finding agreed with that of Babalola and Adeleke (2020) who highlighted that a strong moral

foundation nurtured through stable homes environments fosters resilience and adaptive coping mechanisms, enabling students to better manage stress and psychological challenges. The finding also is in line with that of, Chukwuma and Eze (2021) who emphasized that moral orientation influences decision-making and behavior, which can either mitigate or exacerbate the emotional consequences of familial disruption. In contexts where homes breakdown undermines moral guidance, students may struggle with feelings of uncertainty and ethical conflict, adversely affecting their mental wellbeing.

Moreover, moral factors act as internal regulators that shape emotional responses and social behaviors, thereby indirectly influencing mental health outcomes. The study agreed with Ali and Mohammed (2022) who shows that moral clarity promotes emotional stability and psychological balance, especially during formative years. Students from broken homes who lack consistent moral support may experience increased vulnerability to anxiety, depression, and low self-esteem. The significant association found in this study aligns with these perspectives, underscoring the importance of reinforcing moral education and counseling interventions within academic institutions to bolster students' mental health resilience.

Secondly on the Social Factors and Mental Wellbeing the analysis also indicates statistically significant effect of social factors related to broken homes and the mental wellbeing of students. This finding challenges the prevalent notion that social disruption from homes breakdown inherently undermines psychological health. The finding agreed with that of Usman and Okoro (2022) who highlighted that the quality and perceived adequacy of social relationships, rather than their mere existence, are pivotal for mental health. Many students may compensate for weakened traditional social bonds through alternative social networks, such as friendships, peer groups, or online communities, which provide emotional and social support.

The finding also agreed with Onyeka and Umeh (2019) who further caution that social support is complex; not all social connections are beneficial, as toxic or demanding relationships can exacerbate stress. Adamu and Musa (2021) also highlight that social resilience students' ability to adapt and maintain healthy social interactions despite adversity plays a critical mediating role. These perspectives help explain why social factors related to broken homes has significant influence on mental wellbeing in this study, suggesting

that students may have found compensatory social structures or developed resilience that buffers negative impacts.

Implication for Counselling

The counselling implications of this study suggest that group counselling treatments are essential for this category of students. They must be handled by qualified professionals, particularly counsellors, who are well-equipped with the techniques and skills to assist them in becoming productive. This involves helping them recognize negative thoughts and behaviours and learn to restructure and root out their dysfunctional psychological cognition to improve themselves in achieving positive outcomes. Therefore, counsellors should equip themselves with the knowledge of group counselling as effective technique for mental wellbeing of these students.

The government should establish 24/7 counselling service in all the high institutions in the country and only professional counsellors should be employed. This will ensure that students with personal-social problems can receive assistance, open up, and undergo counselling treatment from specialists.

Conclusion

This study investigated the effect of broken homes on mental wellbeing among undergraduate students in Sokoto state owned universities: implication for counselling. Based on the findings of the study as well as the discussions, the conclusions drawn were that

The moral factors associated with broken homes demonstrate a statistically significant effect on the mental well-being of undergraduate students in Sokoto State, Nigeria.

Furthermore, the social factors associated with broken homes demonstrate a statistically significant effect on the mental well-being of undergraduate students in Sokoto State, Nigeria.

Recommendations

1. Undergraduate Students should always consult with mental health professionals, such as therapists or counsellors, to address emotional challenges.
2. Students should be encouraged to learn healthy coping mechanisms, such as stress management, self-care, and problem-solving skills as well as prioritize physical and emotional well-being through activities like exercise, meditation, or hobbies.

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Exploring the Relevance of Sheikh Usman Danfodiyo's Curriculum Implementation: Foundational Insights for 21st-Century Nigeria

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Abstract

The primary objective of this study is to explore the relevance of Sheikh Usman Danfodiyo's curriculum implementation by examining its foundational underpinnings through historical, philosophical, psychological, and sociological lenses. The paper adopts a qualitative historical and critical analysis approach. Thematic content analysis and critical discourse analysis (CDA) were employed to identify the core educational principles in Danfodiyo's writings based on four analytical lenses namely: historical, philosophical, psychological, and sociological principles. The paper reveals that as a prominent Islamic scholar and reformer, Danfodiyo developed an educational system deeply rooted in Islamic epistemology, moral discipline, and communal responsibility. It also demonstrates that Danfodiyo's curriculum model emphasized the integration of revealed and rational knowledge, character formation, and societal transformation. Drawing from historical analysis, the study situates Danfodiyo's educational reforms within the socio-political realities of 19th-century Hausaland, highlighting their resistance to moral decay and colonial influence. Philosophically, the curriculum reflects a balance between traditional Islamic thought and rational inquiry. Psychologically, it prioritized cognitive and moral development aligned with spiritual consciousness. Sociologically, it fostered social cohesion, justice, and leadership through education. By contextualizing these foundations within Nigeria's contemporary educational challenges such as ethical decline, curriculum fragmentation, and relevance to societal needs whereby the study underscores the significance of reviving Danfodiyo's integrative model. It is recommended that educational stakeholders in Nigeria should advocate for a curriculum reform that does not only transmit knowledge but also cultivate intellect, values, and civic responsibility in alignment with national development goals and Islamic educational ideals.

Keywords*:* Curriculum implementation, historical, philosophical, psychological and sociological relevance

Introduction

Education has always been a powerful instrument for shaping individual character and transforming societies. In the context of Nigeria, the legacy of Islamic education particularly as pioneered by Sheikh Usman Danfodiyo in the 19th century which offers profound insights into how curriculum can serve not just intellectual development, but also moral, spiritual, and social reform. Sheikh Usman Danfodiyo, a renowned Islamic scholar, reformer, and the founder of the Sokoto Caliphate, championed an educational philosophy rooted in the Qur'an, Sunnah, rational inquiry, and societal relevance (Mahmud, 2016; Kareetiparamb, 2022; Sabo, 2025). His curriculum was not merely a transmission of religious knowledge but a comprehensive model aimed at cultivating ethical leadership, critical reasoning, and community welfare.

Danfodiyo's approach to education was grounded in four major foundational dimensions: historical, philosophical, psychological, and sociological. Historically, his curriculum responded to the challenges of moral corruption, social injustice, and ignorance prevalent in the pre-reform society of Hausaland (Alaso, 2022). Philosophically, it emphasized a harmonious relationship between divine revelation and rational thought, fostering both faith and intellect. Psychologically, the curriculum supported personal transformation by nurturing moral consciousness and self-discipline. Sociologically, it aimed to create a just and cohesive society through inclusive learning, civic responsibility, and social justice (Knight, 2023).

The necessity and motivation of this study stem from the urgent need to address the persistent challenges facing Nigeria's education system, such as ethical decline, curriculum fragmentation, and limited societal relevance. Investigating the relevance of Sheikh Usman Danfodiyo's curriculum implementation is timely because his educational model was not only rooted in Islamic epistemology but also emphasized the integration of knowledge, moral discipline, and communal responsibility.

Sheikh Usman Danfodiyo's curriculum implementation can be understood through four interrelated dimensions. Historically, it emerged as a response to the intellectual stagnation, moral decay, and injustice in pre-jihad Hausaland, positioning education as a tool for societal reform (Babatunde, 2025). Philosophically, it harmonized *naqliyyah* (revealed knowledge) and *ʿaqliyyah* (rational knowledge), rejecting the sacred–secular divide and promoting a

unified epistemology grounded in faith and reason. Psychologically, the curriculum emphasized *tarbiyah* (moral nurturing), *tazkiyah* (self-purification), and reflective reasoning, aligning knowledge with character formation, discipline, and independent thinking. Sociologically, it sought to foster social cohesion, justice, and inclusive participation, with figures like Nana Asma'u advancing female literacy and community engagement (Brain & Guts, 2021; Knight, 2023). Together, these dimensions highlight Danfodiyo's vision of education as a holistic enterprise aimed at intellectual growth, moral integrity, and societal transformation as an approach still relevant to Nigeria's contemporary educational challenges. By examining its foundational underpinnings through historical, philosophical, psychological, and sociological lenses, the study seeks to uncover how Danfodiyo's approach fostered intellectual growth, moral development, social cohesion, and transformative leadership. Aligning these insights with contemporary educational realities, the study is motivated by the conviction that reviving and adapting Danfodiyo's integrative curriculum can inform reforms that balance knowledge acquisition with value formation, civic responsibility, and national development goals (Rahman & Azzahra, 2024).

In the face of 21st-century educational challenges in Nigeria such as curriculum disconnection from societal needs, moral decline, youth radicalization, and lack of civic engagement; hence, there is a growing need to revisit and re-contextualize the foundational principles of Danfodiyo's educational system. His model offers a viable framework for addressing contemporary issues through an integrative, value-based, and socially responsive curriculum (Ibeh, 2022; Rahman, 2024). Most studies on the contributions of Sheikh Usman Danfodiyo have not examined his curriculum implementation, particularly from the perspective of its foundational underpinnings; which is an important gap in the literature that this study seeks to address. This study, therefore, explores the relevance of Sheikh Usman Danfodiyo's curriculum implementation by analyzing its foundational underpinnings and their applicability to modern Nigerian education. It seeks to inform curriculum reform efforts that aspire to align intellectual growth with ethical values and national development objectives.

Theoretical framework

This study is framed by a blended sociocultural–situated learning perspective that treats Danfodio's curriculum as a socially mediated, practice-based

system of knowledge transmission. Sociocultural theory (SCT) foregrounds how higher cognitive functions develop through socially organized activity, language, and guided participation; in Danfodio's model, mosque-centred *halaqāt*, teacher–apprentice relationships and circulating teacher networks function as cultural tools and mediating artefacts that shaped learners' cognition and moral dispositions (Gray, 2020). Framing the historical curriculum through SCT highlights how learning was distributed across social institutions (household, mosque, judicial forums) and how more-knowledgeable others (teachers, *jajis*/Yan-Taru leaders) scaffolded novices into competent community actors.

Complementing SCT, Situated Learning / Communities of Practice (CoP) theory interprets Danfodio's system as a set of overlapping communities of practice in which newcomers gained legitimacy through participation (legitimate peripheral participation) and gradually adopted the language, genres, and moral routines of the caliphate's scholarly and administrative life. This lens helps explain the resilience and spread of the curriculum: rather than abstract, decontextualized lessons, learning took place in "real" sociopolitical tasks (qāḍī rulings, manuscript production, preaching) that made knowledge immediately useful and transferable across localities. Understanding Danfodio's legacy as CoPs foregrounds the roles of apprenticeship, ritualized certification (ijāzah-style recognition), and itinerant teacher networks in enabling scalable pedagogic reproduction.

Because the inquiry is concerned with translating historical practice into contemporary policy, the framework integrates implementation Science and curriculum-change scholarship to bridge descriptive history with actionable reform. Implementation concepts (e.g., attention to context, capacity building, fidelity vs. adaptation, multi-level supports) show how historically embedded practices might be responsibly adapted for modern schooling: the design must align with local institutional conditions, identify enabling supports (teacher preparation, materials, community governance), and anticipate barriers (resources, policy incoherence). Using implementation frameworks (including CFIR and OECD curriculum-reform principles) enables systematic mapping from Danfodian principles (community-embedded teaching, moral formation, literacies) to 21st-century reform levers (teacher development, curriculum design, assessment, governance).

Finally, the framework adopts a culturally responsive / indigenous knowledge orientation: Danfodio's curriculum is treated as a historically situated curriculum with explicit moral and civic aims whose contents and pedagogies (Arabic literacy, Qurʾānic exegesis, ethics, female teacher networks) can inform curricula that are culturally coherent and legitimacy-bearing in northern Nigerian contexts. Empirical studies of contemporary Nigerian Islamic education, textbook inclusion, and recent syntheses of Sokoto-era pedagogies demonstrate both continuity (literacy practices, teacher networks) and rupture (colonial reforms, curricular marginalization), suggesting careful, selective re-incorporation rather than wholesale transplantation (Azembeh, 2024). This combined lens (SCT + CoP + Implementation Science + culturally responsive pedagogy) yields a practical research programme: (1) identify Danfodian pedagogic mechanisms with high contemporary affordance (e.g., community teacher networks, apprenticeship, moral formation modules); (2) pilot context-sensitive adaptations using implementation cycles; (3) evaluate effects on literacy, moral outcomes, and social cohesion.

Curriculum Implementation and its Foundational Lenses

The relevance of Sheikh Usman Danfodiyo's curriculum implementation in contemporary Nigerian education can be examined through four foundational lenses: historical, philosophical, psychological, and sociological. These perspectives provide a holistic understanding of his educational vision and its significance for 21st-century curriculum reform in Nigeria. Sheikh Usman dan Fodio's curriculum implementation combined rigorous Islamic learning with practical, community-oriented education: core study of the Qurʾān, ḥadīth, fiqh and Arabic literacy was delivered through mosque-centered study circles (halaqāt), madrasah instruction, and teacher–apprentice relationships rather than Western timetabled schools, producing a system that balanced memorization, dialectical debate, and applied jurisprudence (Gray, 2020; Idriss, 2022; Kane, 2022; Moslimany, Otaibi & Shaikh, 2024). These methods emphasized moral formation and civic responsibility alongside textual scholarship, and Danfodiyo's endorsement of broad literacy including the education of women and the institutionalization of teacher networks such as those organised by Nana Asmaʾu — helped spread qualified instructors and standardised religious practice across the Sokoto polity (Gray, 2020; Akintola, 2023).

Implementation was also deliberately adaptive and locally embedded: curricula were localized to meet diverse community needs while preserving core Islamic sciences and Arabic literacy so as to support legal adjudication, preaching, and manuscript production; education was thus integrated with social institutions (mosques, courts, residential study circles), which made learning immediately useful to governance and social reform (Alaso, 2022; Idriss, 2022). Contemporary scholarship links that historical model to present debates on moral formation and curriculum relevance in northern Nigeria, arguing that the Sokoto pedagogical legacy (teacher networks, practical orientation, and moral-ethical emphasis) offers resources for current education reforms and civic renewal initiatives (Gray, 2020; Rahman, 2024). More importantly, each of the four foundational lenses: historical, philosophical, psychological, and sociological is elaborated in the subsequent paragraphs.

First, Regarding the historical foundations, Sheikh Usman Danfodiyo's educational reform emerged in the late 18th and early 19th centuries as a deliberate response to the social injustices, ignorance, and moral decay that plagued leadership in Hausaland (Idris & Ibrahim, 2017). At a time when scholarship was stagnating and rulers were accused of corruption and oppression, Danfodiyo conceived education as both a divine mandate and a practical tool for societal renewal (Mahmud, 2016; Akintola, 2023). His curriculum was rooted in the Islamic intellectual tradition, incorporating Qur'anic exegesis, Hadith studies, jurisprudence, and Arabic grammar as its core disciplines. However, his vision was not limited to the strictly religious sciences. He also encouraged the study of logic, poetry, and history, reflecting his belief in a well-rounded intellectual formation that could equip individuals with the skills to understand, interpret, and respond to the social realities of their time (Al-Amin, 2023; Amanambu, 2017; Shehu, 2025).

Danfodiyo's writings, particularly *Bayan Wujub al-Hijra*, underscore the centrality of knowledge in confronting tyranny, curbing moral corruption, and establishing justice (Azembeh, 2024). For Danfodiyo, learning was never an end in itself but a means of cultivating morally upright individuals who would actively contribute to building a just and cohesive society. This model of education consciously linked intellectual pursuits with social reform, distinguishing it from forms of education that prioritize knowledge acquisition without ethical grounding. In contrast, many modern curricula in Nigeria emphasize certification and academic qualifications over character development and communal impact, a shift that has often contributed to

graduates who are skilled but ethically deficient (Al-Amin, 2023). Danfodiyo's historical approach thus provides a valuable reminder of the transformative role education can play when firmly tied to values, justice, and the collective good.

Second, Philosophically, Sheikh Usman Danfodiyo's curriculum reflects an Islamic worldview in which knowledge (*ʿilm*) serves both spiritual and temporal purposes. Unlike systems that divide knowledge into sacred and secular domains, Danfodiyo advanced a synthesis of *naqliyyah* (revealed) and *ʿaqliyyah* (rational) sciences, insisting that revelation and reason are complementary sources of truth (Ogunnaike, 2020; Gray, 2020). This epistemological framework was grounded in the maqāṣid al-sharīʿah (objectives of Islamic law), particularly the preservation of intellect (*ḥifẓ al-ʿaql*), religion (*ḥifẓ al-dīn*), and human life and society (*ḥifẓ al-nafs*). For Danfodiyo, the pursuit of knowledge was inseparable from the moral and social responsibilities of the learner, making education a holistic enterprise that guided both the soul and the intellect. His philosophical outlook thus challenged reductionist approaches to learning and positioned education as a means of cultivating wisdom, justice, and communal wellbeing.

This integrative orientation resonates strongly with contemporary debates on curriculum reform, especially in contexts like Nigeria where secular education often marginalizes ethical reasoning and spiritual consciousness. Muslim thinkers such as Al-Attas and Adebayo (2019) have argued for an epistemologically grounded curriculum that transcends mere technical competence to include ethical and metaphysical dimensions. Danfodiyo's approach offers a powerful model in this regard, as it unites intellectual rigor with spiritual enrichment, producing learners who are both critically reflective and morally upright. In contrast to the fragmentation and moral disorientation that characterize many modern educational systems, his philosophical vision provides an antidote by restoring harmony between knowledge, faith, and social responsibility which are elements essential for developing balanced individuals capable of contributing meaningfully to national development and global engagement.

Third, from a psychological perspective, Sheikh Usman Danfodiyo's curriculum placed strong emphasis on the internal transformation of learners through *tazkiyah* (purification of the soul) and *tarbiyah* (holistic nurturing). He viewed the learner as a moral agent whose intellectual growth could not be

separated from spiritual and emotional maturity (Nasir, 2016). This vision positioned education as more than the transfer of knowledge; it was a process of shaping character, disciplining desires, and cultivating resilience. His learning environments encouraged reflective thinking, moral reasoning, and self-regulation, allowing students to internalize values rather than merely memorize facts. Such a model aligns closely with modern psychological theories of moral and cognitive development, including Piaget's emphasis on stages of reasoning and Kohlberg's focus on moral judgment (Garrigan, Adlam & Langdon, 2018), showing Danfodiyo's pedagogical foresight in linking knowledge with personal transformation.

In contemporary Nigeria, where education is often reduced to mechanical learning, high-stakes examinations, and certification, Danfodiyo's emphasis on character formation and ethical awareness remains profoundly relevant. The prevalence of examination malpractice, indiscipline, and weak value orientation among students illustrates the gap between knowledge acquisition and moral development. Danfodiyo's curriculum offers an alternative model where intellect and values are co-developed, producing learners equipped to navigate complex moral and social challenges. As AbdulRahman (2020) argues, Islamic education that prioritizes personal transformation can significantly contribute to behavioral reform among youth. Thus, his psychological orientation provides a timeless pedagogical framework for fostering balanced individuals who combine cognitive excellence with ethical consciousness.

Fourth, Sociologically, Sheikh Usman Danfodiyo's curriculum functioned as a foundation for societal restructuring and collective empowerment. He conceived education as a mechanism for promoting social justice, fostering community cohesion, and nurturing leadership rooted in knowledge and virtue. By making learning accessible to both men and women, Danfodiyo challenged prevailing norms that often-marginalized female education, thereby advancing a more inclusive vision of knowledge dissemination (Knight, 2023). His sister, Nana Asma'u, embodied this vision by emerging as a leading scholar and organizer of women's educational networks. Through her establishment of female learning circles and mentorship systems, she extended the reach of literacy and moral training to rural and underserved populations, illustrating the socially transformative capacity of Danfodiyo's educational philosophy (Ogunnaike, 2020).

The sociological relevance of Danfodiyo's curriculum remains strikingly pertinent in 21st-century Nigeria, where challenges such as ethnic tensions, gender disparities, educational inequality, and youth radicalization threaten social stability. His model demonstrates how education, when infused with moral principles and civic responsibility, can be a tool for reconciliation, equity, and inclusive leadership. As Hughes and Loader (2023) notes, educational systems anchored in social justice and communal values are vital for national integration. Thus, Danfodiyo's sociological orientation offers a valuable template for contemporary curriculum planning, one that integrates moral education, social cohesion, and leadership development to address Nigeria's pressing social challenges while reinforcing a culture of peaceful coexistence and collective responsibility.

In a nutshell, the reviewed literature affirms that Sheikh Usman Danfodiyo's curriculum implementation was deeply rooted in holistic foundations that remain relevant today. His model addressed intellectual, moral, and social dimensions of learning through an integrative and community-centered approach. Revisiting these foundations can offer valuable insights for curriculum reform in Nigeria, particularly in aligning education with national values, ethical reasoning, and societal transformation.

Methodology

This study adopts a qualitative historical and critical analysis approach to explore the relevance of Sheikh Usman Danfodiyo's curriculum implementation in 21st-century Nigeria. The methodology is grounded in interpretivist paradigms, which emphasize the subjective meanings and contextual realities embedded in historical and educational phenomena. The study utilizes a qualitative historical research design combined with critical document analysis. This approach enables an in-depth exploration of both primary and secondary sources related to Sheikh Usman Danfodiyo's educational philosophy and curriculum practices. It also facilitates a critical interrogation of how the historical, philosophical, psychological, and sociological foundations of his curriculum remain relevant to contemporary educational challenges in Nigeria.

The data for this study were derived from both primary and secondary sources. On one hand, primary sources include selected writings, letters, poems, and legal treatises of Sheikh Usman Danfodiyo and his contemporaries (e.g.,

Bayan Wujub al-Hijra, *Tanbih al-Ikhwan*, and the works of Nana Asma'u). These texts were accessed through historical archives, published translations, and academic collections. On the other hand, secondary sources consist of peer-reviewed journal articles, historical monographs, theses, and scholarly analyses that discuss the Sokoto Caliphate's educational practices, Danfodiyo's reforms, and Islamic curriculum theory. Works of scholars such as Brain & Guts, 2021; Kareetiparamb, 2022; Knight, 2023; Sabo, 2025) formed part of the data corpus. The data were analyzed using thematic content analysis and critical discourse analysis (CDA). Thematic content analysis was employed to identify and categorize the core educational principles in Danfodiyo's writings based on four analytical lenses: historical, philosophical, psychological, and sociological. Themes such as knowledge transmission, moral formation, social justice, and rational-religious integration were extracted and interpreted.

Critical discourse analysis was applied to examine how power, ideology, and epistemological assumptions are embedded in Danfodiyo's educational discourses and how these align or contrast with modern educational frameworks in Nigeria. The interpretation was guided by contemporary educational theory, Islamic pedagogy, and the Maqāṣid al-Sharīʿah framework, particularly focusing on the objective of *ḥifẓ al-ʿaql* (preservation of intellect). To ensure credibility and trustworthiness, the paper applied cross-referencing of various historical documents and scholarly interpretations. Peer debriefing was employed through academic consultation with experts in Islamic education and Nigerian history (Adigun, 2025). The study also maintained confirmability through detailed documentation of data sources and analytic processes. Despite the significance of this study which focuses on the intellectual and pedagogical contributions of Sheikh Usman Danfodiyo as they relate to curriculum implementation (Moumouni, 2021). While acknowledging his broader socio-political influence, the scope is limited to the foundational educational principles and their potential relevance to curriculum reform in 21st-century Nigeria. The study does not attempt to offer a full biography but rather a focused curriculum analysis from a foundational perspective.

Results and Discussion of Findings

This section presents the findings based on the four foundational variables of the study: historical, philosophical, psychological, and sociological insights

derived from Sheikh Usman Danfodiyo's curriculum implementation, and their relevance to contemporary educational challenges in Nigeria.

First, the historical analysis reveals that Sheikh Usman Danfodiyo's curriculum was developed as a conscious response to the intellectual stagnation, moral decay, and widespread injustice that characterized pre-jihad Hausaland (Hassan, 2020). During this period, the educational system had become largely stagnant, with a narrow focus on rote memorization and ritual practice, while neglecting critical engagement with Islamic sciences and broader intellectual traditions. This decline was accompanied by corruption among scholars and rulers, resulting in the erosion of moral standards and the exploitation of ordinary people. Against this backdrop, Danfodiyo envisioned education not as an isolated academic pursuit but as a tool for restoring justice, moral order, and spiritual consciousness within the society (Azembeh, 2024; Shehu, 2025).

Central to his reformist vision was the conviction that knowledge must translate into practice and social transformation. Through seminal works such as *Bayan Wujub al-Hijra*, Danfodiyo articulated the necessity of reviving authentic Islamic learning as a means of addressing both personal and collective shortcomings. His writings consistently emphasized the integration of revealed knowledge with rational inquiry, advocating for a holistic system that developed intellect, purified the soul, and instilled discipline. In this way, his curriculum sought to empower individuals not only with scholarly competence but also with the moral and spiritual resources required to resist injustice, confront corruption, and uphold the ethical ideals of Islam in governance and daily life.

Moreover, Danfodiyo's educational reforms reflected a deliberate attempt to align intellectual pursuits with the broader goals of societal renewal. His model of learning was inseparable from the struggle for social justice, communal solidarity, and responsible leadership. Education under his framework was designed to cultivate leaders who combined knowledge with integrity and service to the community, thereby breaking the cycle of exploitative leadership that had plagued Hausaland. By embedding his curriculum within the socio-political realities of his time, Danfodiyo demonstrated the transformative power of education as both a spiritual and political act, laying the foundation for a reformist tradition that continues to hold relevance for contemporary discussions on curriculum development and

societal change. This finding is particularly relevant in 21st-century Nigeria, where educational systems face crises of moral disengagement, declining quality, and disconnection from societal realities (Akinsanya, Opaaje, Aina,Fadipe & Agbeja-Folorunke, 202). Danfodiyo's historical precedent positions curriculum as a transformative force, suggesting that historical consciousness and values-based content can revitalize the Nigerian educational landscape.

Second, Philosophically, Sheikh Usman Danfodiyo's curriculum was anchored in the harmonization of *naqliyyah* (revealed knowledge) and *ʿaqliyyah* (rational knowledge), thereby rejecting the artificial dualism between the sacred and the secular (Abdullah, 2013; Al-Attas, 1993). He advanced a unified epistemology that treated knowledge as an interconnected whole, where spiritual wisdom and rational inquiry complemented one another. This framework aimed to cultivate learners who were not only grounded in religious devotion but also intellectually equipped to critically engage with diverse issues in society. By doing so, Danfodiyo demonstrated that the pursuit of knowledge in Islam is holistic, with no contradiction between revelation and reason, faith and intellect, or morality and scholarship.

His philosophical outlook promoted intellectual independence while maintaining fidelity to Islamic moral values. Unlike fragmented systems that confine religious knowledge to ritualistic domains or treat rational sciences as detached from spiritual concerns, Danfodiyo's approach placed knowledge within an ethical and transcendent framework. This vision empowered students to use rational tools responsibly, guided by divine principles, thereby producing individuals capable of addressing the material and spiritual needs of their communities. In this sense, his curriculum was not only an intellectual project but also a moral compass for societal transformation, fostering a worldview where knowledge was always tied to justice, responsibility, and the pursuit of the common good.

In the contemporary Nigerian context, where secular curricula often marginalize spiritual and ethical content, this integrative philosophy offers a viable model for epistemological balance. Adebayo (2019) argues that such synthesis could bridge the gap between Western-style education and Islamic educational needs, particularly in northern Nigeria where the tension between the two systems is most pronounced. The implication is that curriculum reform in Nigeria should not merely imitate foreign models but be grounded in local

epistemologies that reflect both religious identity and global relevance. By adopting Danfodiyo's harmonized vision of knowledge, Nigeria's educational system could foster graduates who embody intellectual excellence, moral uprightness, and civic responsibility, qualities essential for addressing the country's developmental and ethical challenges. Third, the study finds that Sheikh Usman Danfodiyo's curriculum paid significant attention to the psychological formation of learners, reflecting a deep concern for the inner development of the individual. His pedagogical model placed strong emphasis on *tarbiyah* (holistic moral nurturing), *tazkiyah* (self-purification), and reflective reasoning, ensuring that learning was not a mechanical process but a transformative journey. In this framework, education sought to harmonize intellectual growth with emotional maturity and spiritual consciousness, aligning closely with modern theories of cognitive and moral development that stress the interplay between reasoning, behavior, and values (Garrigan, Adlam & Langdon, 2018; Nasir, 2016).

Unlike approaches that confined education to rote memorization of texts, Danfodiyo's method aimed at cultivating ethical behavior, discipline, and independent thinking. He believed that knowledge without corresponding moral action was incomplete, and that the true measure of learning was its impact on character and conduct. This emphasis on personal responsibility and reflective engagement created an educational environment where learners were trained to internalize values, make sound judgments, and become agents of positive change in their communities. Such an approach demonstrates that his curriculum was far ahead of its time in recognizing the psychological dimensions of effective pedagogy.

In the present Nigerian context, where education is often undermined by examination malpractice, indiscipline, and a lack of character formation, Danfodiyo's psychological orientation is highly instructive. AbdulRahman (2020) notes that Islamic education models centered on personal transformation and moral consciousness can play a critical role in addressing youth behavioral crises. By focusing on both the intellect and the soul, Danfodiyo's model offers a holistic framework for 21st-century pedagogy, one that seeks not only to produce knowledgeable graduates but also morally grounded and socially responsible citizens capable of contributing to national development and ethical renewal.

Fourth, the sociological dimension of Sheikh Usman Danfodiyo's curriculum was intentionally designed to foster social cohesion, justice, and civic responsibility within the wider community. His educational philosophy viewed learning not as an individual pursuit but as a collective obligation aimed at building a just and morally upright society. Knowledge, in this framework, was inseparable from responsibility, and education became a vehicle for cultivating leaders who embodied integrity, wisdom, and service to their people. By linking learning to social transformation, Danfodiyo's model ensured that education was directly relevant to the needs and stability of the community.

A notable feature of this sociological orientation was its inclusivity. The Sokoto Caliphate's educational system empowered both men and women, with leadership being based on knowledge and virtue rather than privilege or status. Nana Asma'u, Danfodiyo's daughter, played a pioneering role in advancing female literacy and public engagement, creating a network of women educators who extended learning opportunities to rural and marginalized communities (Brain & Guts, 2021). Her contributions highlight the community-driven and gender-sensitive nature of Danfodiyo's curriculum, making it one of the earliest Islamic educational models to institutionalize broad-based access to learning as a foundation for social development.

In contemporary Nigeria, where educational inequality, gender disparities, and ethnic tensions continue to challenge national unity, Danfodiyo's sociological insights remain profoundly relevant. Yusuf (2012) emphasizes that education systems rooted in social justice and equity are essential for fostering national integration and peaceful coexistence. Therefore, Danfodiyo's model provides a valuable framework for policy reforms aimed at promoting inclusive, equitable, and value-driven education. By drawing from his legacy, Nigeria can move towards an education system that not only imparts knowledge but also cultivates social harmony, civic responsibility, and shared identity in a pluralistic society.

Based on the foregoing analysis, summary of findings is presented as follows:

1. Historically, Danfodiyo's curriculum responded to societal crises through education and moral reform.
2. Philosophically, it integrated revealed and rational knowledge, challenging epistemological fragmentation.

3. Psychologically, it emphasized the moral, cognitive, and emotional development of learners.
4. Sociologically, it promoted justice, gender inclusivity, and community empowerment through education.

These foundational insights make Danfodiyo's educational philosophy a valuable framework for contemporary curriculum transformation in Nigeria. The findings advocate for a return to integrative, ethical, and context-relevant education systems that address both national development goals and spiritual-moral imperatives.

Implications of the Study

The findings of this study on the relevance of Sheikh Usman Danfodiyo's curriculum implementation have significant implications for both Islamic educational studies and curriculum development in contemporary Nigeria. These implications relate to the integration of foundational principles (i.e., historical, philosophical, psychological, and sociological aspects) into the design, delivery, and reform of Islamic education in ways that align with national development, moral renewal, and intellectual advancement.

This study emphasizes the need to re-engage with classical Islamic educational heritage, particularly that of indigenous scholars like Sheikh Usman Danfodiyo. Educational research in Nigeria should move beyond Western pedagogical frameworks to critically examine indigenous models of learning, leadership, and reform. Danfodiyo's integrative approach provides a distinctly African-Islamic model of education rooted in socio-cultural realities. Future studies should explore this and other regional educational legacies to develop locally relevant theories of Islamic pedagogy, rather than importing models with limited contextual value. The sociological and psychological foundations of Danfodiyo's curriculum suggest that Islamic education should not be studied merely as a theological or devotional subject, but as a discipline that intersects with social justice, civic education, gender equity, and psychological development. This opens up interdisciplinary research possibilities within Islamic education studies.

Curriculum designers in Nigeria should incorporate Danfodiyo's philosophy of harmonizing *naqliyyah* (revealed) and *ʿaqliyyah* (rational) knowledge. This integration allows for the development of students who are spiritually

grounded and intellectually competent, thereby addressing the epistemological gap in many contemporary curricula. Danfodiyo's focus on *tarbiyah* and *tazkiyah* indicates that Islamic education should go beyond academic instruction to include the systematic development of character, self-discipline, and ethical reasoning. Curriculum frameworks should mandate character education as a transversal competency, not as an optional extra. His historical and sociological insights suggest that Islamic education must reflect the socio-political and cultural realities of learners (Gray, 2020). Curriculum implementation should prioritize content that responds to contemporary challenges such as corruption, extremism, and social disintegration while maintaining fidelity to Islamic values.

The contributions of Nana Asma'u and the promotion of women's education under the Sokoto Caliphate challenge prevailing gender biases in some Islamic institutions. Curriculum policies should institutionalize female education as a priority, ensuring that both curriculum content and delivery are inclusive, equitable, and accessible (Muhammad, 2016). The successful implementation of a value-based, integrative curriculum requires that teachers themselves embody the principles they teach. Teacher education programs in Islamic institutions should be restructured to include training in critical thinking, ethics, spiritual development, and modern pedagogy in line with Danfodiyo's model of scholar-leaders. Danfodiyo's curriculum was designed to produce leaders committed to justice, accountability, and service. Islamic education in Nigeria should reclaim this objective by embedding civic education, conflict resolution, and leadership training into curriculum content at all levels.

Conclusion and Recommendations

This study has explored the relevance of Sheikh Usman Danfodiyo's curriculum implementation through the lenses of historical, philosophical, psychological, and sociological foundations, highlighting its continued significance for 21st-century Islamic education in Nigeria. Sheikh Usman Danfodiyo's educational model, rooted in historical consciousness, epistemological integration, moral development, and social justice, remains profoundly relevant to the Nigerian educational context. The findings of this study call for a fundamental shift in how Islamic curricula are conceptualized, implemented, and evaluated, with a focus on holistic development, indigenous knowledge systems, and national transformation. The findings demonstrate that Danfodiyo's educational philosophy was holistic, integrative, and reform-

oriented addressing not only the transmission of knowledge but also the transformation of individuals and societies. His curriculum model emphasized the unity of revealed and rational knowledge, character formation, civic responsibility, and social justice which are principles that resonate deeply with contemporary educational needs in Nigeria.

Given the moral decay, fragmentation of knowledge, disconnect between education and societal realities, and growing extremism in parts of Nigeria, Danfodiyo's model offers a transformative framework that can guide curriculum reform efforts. Reintegrating these foundational principles into Islamic education can support the development of ethically conscious, intellectually capable, and socially responsible citizens. It can also bridge the gap between traditional Islamic learning and modern educational demands, contributing to national development and peaceful coexistence. Islamic education in Nigeria must move beyond rote memorization and legalistic instruction to a more dynamic, contextualized, and transformative pedagogy. Based on this study, recommendations are made as follows:

5. Islamic education curricula in Nigeria should be restructured to reflect the integration of *naqliyyah* (revealed) and *ʿaqliyyah* (rational) sciences, as exemplified by Sheikh Usman Danfodiyo, ensuring a balance between faith-based and critical, analytical learning.
6. Curriculum planners should include *tarbiyah* (moral nurturing) and *tazkiyah* (self-purification) as core elements of Islamic education, focusing on the development of students' moral and ethical consciousness.
7. Islamic education must be made culturally relevant by addressing local societal challenges such as corruption, injustice, gender inequality, and youth radicalization through context-sensitive content inspired by Danfodiyo's reformist vision.
8. Inspired by Nana Asma'u's legacy, curriculum policies should prioritize gender inclusiveness, promoting female access to quality Islamic education and leadership opportunities.
9. Teachers should be trained in both classical Islamic sciences and modern pedagogical methods, equipping them to deliver a holistic curriculum that integrates values, intellect, and community leadership.
10. Drawing from the sociological foundations of Danfodiyo's model, Islamic education should incorporate civic responsibility, conflict

resolution, and leadership training to foster peaceful coexistence and community development.

11. Government agencies, Islamic institutions, and researchers should invest in documenting and studying indigenous Islamic educational models such as that of Sheikh Usman Danfodiyo to guide culturally grounded and effective curriculum development.

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Assessment of Kwaralearn Computer Managed Instruction in Kwara State Basic Schools

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Abstract

Certain irregularities have been observed by the researchers in recent years in the areas of punctuality among teachers; differences in course content covered by different teachers at different schools in lower basic secondary schools specifically in Kwara State which suggest ineffectiveness among the teachers. It was against this background that the study assess KwaraLEARN computer managed instruction in Kwara State basic schools. The objectives of the study were to: (i) ascertain the extent to which computer managed instruction, KwaraLEARN, has influenced teachers' punctuality in basic schools, Kwara State; and (ii) investigate the extent to which computer managed instruction, KwaraLEARN, has influenced teachers' course content coverage in basic schools, Kwara State. A survey type of descriptive research design was adopted. One thousand, five hundred and seventy-eight headmasters/headmistresses in lower basic schools Kwara State was the population while three hundred and nineteen headmaster/headmistress were sampled using multi-stage random sampling technique. A questionnaire titled "Computer-Managed Instruction on Teachers' Effectiveness Questionnaire" (CMITEQ) was used to obtain data from the headmaster/headmistress. Reliability coefficient of 0.79 was obtained was obtained. Mean was used to answer the research questions. Introduction of KwaraLEARN technology has: positively influenced teachers' punctuality; and positively influence course content coverage were the findings. Grounded on the findings of the study, it was suggested that efforts should be made by the school administrator to sustain the level at which teachers arrive school on time.

Keywords*:* KwaraLEARN, Computer managed instruction, Teacher effectiveness, Teachers' punctuality, Content coverage

Introduction

It has become an increasingly vital aspect of educational reform worldwide, particularly with the integration of Computer-Managed Instruction (CMI) systems into basic education, which comprises the use of computer systems to manage and track the delivery of educational content, assessments, and students' progress. This integration of CMI has been seen not only to promote inclusiveness but also to facilitate efficient and effective instructional delivery which gears towards the achievement of the overall quality education sought.

At the basic education level, which includes primary and junior secondary schools, CMI has been identified as a tool that could significantly improve educational outcomes. (Ojo & Adewole, 2018) noted that teachers can use data from CMI systems to identify students' strengths and weaknesses, enabling them to provide more focused support. With CMI, students can receive tailored learning experiences that cater for their pace and understanding, making education more inclusive. The potential of CMI to enhance both teaching and learning makes it a valuable tool in the ongoing reform of Nigeria's educational system.

Over the past few decades, the integration of digital technology within Nigeria’s education system has gained traction, mirroring global trends in education modernization. In the 1990s, Nigerian schools began introducing computers, initially for administrative tasks, with limited access in urban areas (Ahmed, 2023). In recent years, several Nigerian States have adopted computer-managed instruction (CMI) systems to address specific educational needs and improve teaching effectiveness.

In Lagos State, the Eko Excel program has been instrumental in advancing digitalized instructional management, providing teachers with tablet-based lesson plans, automated attendance tracking, and real-time feedback to facilitate efficient lesson delivery (Adeniran et al., 2021). Similarly, Osadolor (2019) noted that in Edo State, the EdoBEST initiative employs CMI tools to enhance primary education through digital lesson planning, teacher monitoring, and an online portal for tracking attendance and classroom activities. These initiatives illustrate a growing commitment among Nigerian states to leverage digitalisation for educational transformation, aiming to improve teaching quality and learning outcomes.

In a similar trend, the Kwara State Government launched KwaraLEARN (Leading Education Achievement and Reform Now), a digital education initiative, designed to address the specific challenges faced by teachers and students in the state. KwaraLEARN provides a suite of CMI tools that streamline classroom tasks, support lesson planning, and foster overall teacher effectiveness. The KwaraLEARN initiative is designed to enhance teacher effectiveness through a structured, technology-driven approach, focusing on key indicators that directly impact student outcomes.

Oluwole and Adebayo (2021) saw teachers' effectiveness as the consistent demonstration of professional qualities that support optimal learning environments, including punctuality, regular attendance, and timely classroom instruction. According to Adebola and Adedoyin (2016), teachers' effectiveness could be measured in term on their mastery of subject matter, punctuality in class, teachers' commitments and subordination of personal interest. Oluwole and Adebayo (2021) emphasised that effective teachers are committed, well-prepared, and capable of maintaining a healthy psychological state, allowing them to engage students fully and foster academic achievement. Considering the deficiency in teacher effectiveness in basic schools as noted in the study carried out by Obiageli, Badamasi and Olatunji (2020) which revealed that teachers' performance was low, KwaraLEARN could provide a comprehensive computer-managed instruction (CMI) system aimed at addressing issues of punctuality, attendance, promptness in classroom teaching, readiness, and psychological well-being.

Punctuality, as an indicator of teachers being effective, is a cornerstone of effective teaching, reflecting not only a teacher's professionalism and commitment but also their respect for students' learning time. Okeke and Onuka (2022) noted that in educational settings, punctuality is more than just about starting classes on time; it sets a tone for discipline, responsibility, and mutual respect in the classroom. However, in many Nigerian schools, including those in Kwara State specifically, teacher tardiness and irregular attendance have been persistent challenges as observed by the researcher. Through real-time monitoring function of KwaraLEARN, this punctuality challenge is likely to be addressed through its digital scheduling and reminder tools, offering a modern solution to an age-old problem. In addition, these tools empower teachers to better manage their time, ensuring that they are punctual for their classes and remain accountable for their professional duties.

By incorporating technology into time management practices, KwaraLEARN is not only likely to enhance teachers' punctuality but also promotes a culture of punctuality across schools in the state. According to the Kwara State Ministry of Education (2023), schools that have adopted KwaraLEARN have seen a significant reduction in tardiness, with a 20% improvement in punctuality rates over the past years. The impact of KwaraLEARN could also extend beyond merely improving punctuality, it could also contribute to increased attendance, commitment and as well complementing teachers' preparation and readiness for teaching (Kwara State Ministry of Education, 2023). It is based on this background that the study assesses of KwaraLEARN computer managed instruction in Kwara State basic schools.

Statement of the Problem

The importance of teachers' effectiveness in the attainment of educational goals at any level of education cannot be overstressed. This is because teachers are central in instructional delivery as they are responsible for the implementation of the designed curriculum. This suggests that for there to be improvement in students' performance, teachers have to be effective and effectiveness of teachers could be improved in number of ways including digitization of teachers' activities where teachers' activities and progress could be monitored in real-time.

Certain irregularities have been observed by the researchers in recent years in the areas of punctuality among teachers; differences in course content covered by different teachers at different schools as well as non-completion of course content among the teachers in lower basic secondary schools specifically in Kwara State which suggest ineffectiveness among the teachers. This is in congruent with the assertion of Festus, Valentine, and Esther (2019) who noted that displaying behaviours such as non-coverage of syllabus and tardiness among educators indicates that teachers are not effective in their roles and lack seriousness regarding their instructional responsibilities. This observation is well supported by the empirical findings of the study carried out by Obiageli, Badamasi and Olatunji (2020) which showed that that teachers' effectiveness in their instructional strategies was low in Ilorin West.

Abdulazeez et al. (2024) carried out a study on digitisation of primary schools through computer managed instruction programme in the teaching of science in Ilorin Metropolis. Similar study was carried out by Alutu (2024) on the impacts of computer-managed instruction in basic technology education in

junior secondary schools in Anambra State. Also, Abdullahi and Tijani (2019) carried out a study on digitisation in education system and management of early childhood care education in Nigeria. Examining these studies among others, it was discovered that many studies carried out specifically in the context of Kwara State have not investigated the challenges of KwaraLEARN, how students react to teaching using computer managed instruction, KwaraLEARN, as well as, the influence of KwaraLEARN on the effectiveness of teachers since its adoption creating a variable and knowledge gaps. The observed gaps are what motivate the researcher; hence, the study focused on the assessment of KwaraLEARN computer managed instruction in Kwara State basic schools.

Objectives of the Study

The main objective of the study was to assess KwaraLEARN computer managed instruction in Kwara State basic schools. Specifically, the study:

1. ascertained the extent to which computer managed instruction, KwaraLEARN, has influenced teachers' punctuality in basic schools, Kwara State; and
2. examined the extent to which computer managed instruction, KwaraLEARN, has influenced teachers' course content coverage in basic schools, Kwara State.

Research Questions

The following research questions were raised to guide the study

1. To what extent has computer managed instruction, KwaraLEARN, influenced teachers' punctuality?
2. How has computer managed instruction, KwaraLEARN, influenced teachers' course content coverage?

Methodology

A study-based descriptive research design was utilised for this study to gather pertinent data. The study's population consisted of 1,578 headmasters and headmistress in lower basic schools located in Kwara State. Employing a multistage random sampling technique in accordance with Taro Yamane's formulas, a sample size of 319 headmasters and headmistress was selected for

the research. An adapted questionnaire tagged "Computer-Managed Instruction on Teachers' Effectiveness Questionnaire" (CMITEQ) from the studies of AbdulAzeez et al. (2024) and Alutu (2024) was used to illicit information from the participants on the extent to which KwaraLEARN has influenced various aspects of teacher effectiveness.

To ensure the instrument's validity, it was presented to experts in the Department of Educational Management, Faculty of Education, University of Ilorin, Ilorin, for evaluation of both face and content validity. The experts' suggestions and recommendations were integrated into the final draft of the instrument. To determine the reliability. To determine the reliability of the questionnaire copies were distributed a selected group of headmasters who were not included in the study sample. Their responses were analysed using Cronbach's Alpha measure of internal consistency via SPSS, resulting in a reliability coefficient of .79. Mean was used to answer the two research questions raised. The mean score for each items were computed to determine the average level of influence perceived by respondents. The following decision rule guided the interpretation of the mean scores: 3.50–4.00 indicates a High Extent, 2.50–3.49 indicates a Moderate Extent, 1.50–2.49 indicates a Low Extent, and 1.00–1.49 indicates a Very Low or No Extent. However, 319 questionnaires were administered but 306 were returned for analysis, which indicate 95.9% retrieval level.

Results

Research Question One: To what extent has computer managed instruction, KwaraLEARN, influenced teachers' punctuality in basic schools, Kwara State?

Table 1: KwaraLEARN Technology on Teachers' Punctuality

S/N	Items	HE F (%)	ME F (%)	LE F (%)	VLE F (%)	$\bar{X}$
	To what extent has KwaraLEARN improved the arrival of teachers?	218 (71.2)	77 (25.2)	11 (3.6)	-	3.67
	To what extent has KwaraLEARN influenced teachers to be more time-conscious during class presentations?	156 (51)	131 (42.8)	19 (6.2)	-	3.44
	To what extent has KwaraLEARN helped teachers keep to time when going for their lessons?	189 (61.8)	96 (31.4)	14 (4.6)	7 (2.3)	3.52
	To what extent has KwaraLEARN influenced teachers to turn in their exam questions and results on	132 (43.1)	106 (34.6)	47 (15.4)	21 (6.9)	3.14

time?	
Grand Mean	3.51

The results on table 1 showed the opinion of headmaster/headmistress on the influence of KwaraLEARN technology on teachers' punctuality. Based on the responses from the headmaster/headmistress, it was shown that the introduction of KwaraLEARN technology has positively influence teachers' punctuality with a mean score of 3.51. Specifically, the respondents rated the contribution of KwaraLEARN on how teachers often arrive at school on time having to high extent with 218 participants representing 71.2%. In the same vein, 156 representing 51% and 189 representing 61.8% rated contribution of KwaraLEARN in helping teachers to be more time-conscious during class presentations and helping teachers keep to time when going for their lessons respectively to a high extent.

Research Question Two: How has computer managed instruction, KwaraLEARN, influenced teachers' course content coverage in basic schools, Kwara State?

Table 2: KwaraLEARN Technology on Course Content Coverage

S/N	Items	HE F (%)	ME F (%)	LE F (%)	VLE F (%)	$\tilde{X}$
	To what extent has the time allotted by KwaraLEARN allowed teachers to cover the course content?	146 (47.7)	133 (43.5)	25 (8.2)	2 (.7)	3.38
	To what extent has the wide syllabus under KwaraLEARN made teachers work harder to cover course outlines?	137 (44.8)	133 (43.5)	34 (11.1)	2 (.7)	3.32
	To what extent has KwaraLEARN led teachers to assign take-home tasks?	160 (52.3)	121 (39.5)	23 (7.5)	2 (.7)	3.43
	To what extent has teachers' workload under KwaraLEARN affected lesson coverage?	132 (43.1)	106 (34.6)	47 (15.4)	21 (6.9)	3.14
	Grand Mean					3.32

The result on table 2 revealed the opinion of headmaster/headmistress on how computer managed instruction, KwaraLEARN, has influenced teachers' course content coverage in basic schools, Kwara State. Based on the responses from the school administrators, it was shown that the introduction of KwaraLEARN technology has positively influence course content coverage with a mean score of 3.32. Specifically, the respondents rated the contribution of how KwaraLEARN led teachers to assign take-home tasks to a high extent with 51.9% of the respondents rating the item very high extent.

Discussion

One of the findings of the study revealed the influence of KwaraLEARN technology on teachers' punctuality. Based on the responses from the headmaster/headmistress, it was shown that the introduction of KwaraLEARN technology has positively influence teachers' punctuality. Specifically, the respondents rated the contribution of KwaraLEARN on how teachers often arrive at school on time having to high extent. In the same vein, it was revealed that the contribution of KwaraLEARN in helping teachers to be more time-conscious during class presentations and helping teachers keep to time when going for their lessons respectively to a high extent. The result of this study implies that KwaraLEARN technology has been able to influence teachers' punctuality on number of ways. Based on the analysis in the findings of the study, it was observed that KwaraLEARN technology have immensely improve how often teachers arrive at school on time, influenced teachers to be more time-conscious during class presentations and helped teachers keep to time when going for their lessons to a high extent while influencing how teachers to turn in their exam questions and results on time to a moderate extent. Findings of the study align with Adebayo and Yusuf (2021) which revealed that KwaraLEARN has impact on teachers' punctuality.

Also, one of the findings of the study revealed that the introduction of KwaraLEARN technology has influenced the level of teachers' course content coverage in basic schools, Kwara State. This finding showed that the respondent agreed that the time allotted by the technology has allowed teachers to cover their content to a higher extent. Similarly, the result of the study suggested that the introduced technology has motivated the teachers to work harder to cover wide syllabus and also motivate the teachers to give assignments to students to make up for the uncovered areas in the syllabus. The result suggested that not only has the introduction of KwarLEARN technology has motivated teachers to cover their syllabus but get them to critically think on several means that could be used to ensure that their course content is covered. This finding aligns with Sam-Ekeke (2021) which indicated that CMI significantly enhances the teaching and learning process, showing that students who engaged with CMI learned more quickly and effectively than their peers who did not.

Conclusion

Based on the findings which stemmed from the data collected and analyzed with the results obtained, it could be concluded that, the introduction of KwaraLEARN technology in Kwara State basic school has positively influenced teacher' punctuality and content coverage overall effective teaching and learning in schools.

Recommendations

Based on the findings, the following recommendations were made:

3. efforts should be made by the school administrator to sustain the level at which teachers arrive school on time and integrate some functions on KwaraLEARN that will ensure that teachers turn in their exam questions and results on time; and
4. teachers should be encouraged to critically think on several means that could be used to ensure that their course content is being covered.

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Qur'anic Antidotes to Prevalence of Depression Among University Students: The Case of University of Ilorin

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Abstract

Depression among students in the university has become a pressing mental health challenge majorly caused by academic stress, social pressures and existential concerns. This work studied Qur'anic coping mechanisms for mental well-being in institutions of higher learning with focus on depression among students at the University of Ilorin. The research identified the prevalence of depression among students in institutions of higher learning and emphasizes verses of the Qur'an and its understanding as alternative remedy to depression in the society. Deploying a descriptive and content analysis research methods with the use of in-depth interview and focus group discussion for data collection, the work reveals a high rate of cases of depression in the university, and that students who actively involved in adopting Qur'an guidance are likely to be less vulnerable to depression. Qur'an verses guarantee greater resilience, inner peace and optimism in confronting life challenges. The study concludes that imbibing teaching of the Qur'an in our life will go a long way in alleviating mental health challenges in the society and will thereby foster holistic well-being among students

Keywords*:* Depression, mental health, academic stress, social pressure, Islamic coping mechanism

Introduction

Depression, among other mental health challenges is a common mental illness that terrorizes the emotional, social, physical, and mental health status of a man. While depression can affect anyone, research has shown that certain populations such as women, individuals with a family history of depression, and those who have experienced traumatic events may be at a higher risk. Understanding the factors that contribute to the development of depression and identifying effective treatments is essential in promoting mental health and improving outcomes for individuals living with this condition.

Depression is more pronounced among students in institutions of higher learning because such students are on the line of endurance as a result of transition from adolescence to adulthood which is one of the most stressful stages in human life. Trying to fit-in among their peers, trying to meet up with the society expectations, maintaining good grades, balancing social life and planning for future can be draining and hence, cause anxiety for a lot of students

The University of Ilorin is one of the Nigerian leading universities in the North Central Zone of Nigeria, accommodating a large number of students with an average age of 20. This implies that the university students are young and also at the level of transitional and as a result, there is hardly no year that the university will not record cases of students being depressed either as a result of academic stresses or failure in meeting up with academic targets. This crisis continues to reoccur despite efforts made by the university counseling unit to contain the situation. Coincidentally, Students in the University are predominantly Muslims who will be interested in having the teaching of Islam as solution to their problems.

Islam offers a comprehensive solution to various psychological distresses. Allah is the creator of mankind; He knows the chemistry of his creator and the best solution to any emanating. It is on this basis that authors of this work examine the relevance of Islamic coping mechanism for depression in institutions of higher learning using the University of Ilorin as case study.

Depression is a mood disorder characterised by persistent feelings of sadness, hopelessness, and a loss of interest or pleasure in activities that were once enjoyed. Other symptoms may include changes in appetite and sleep patterns. Numerous literature evidences suggest that medical students experience

mental health problems due to constant exposure to stressful conditions, such as academic burden to study a vast field, pressure from parents, fear of failure, labour market challenges, and vulnerability to diverse emotional outbreaks (Tabalipa, 2015).

The academic pressure experienced by students can lead to a sense of hopelessness and helplessness, which are common symptoms of depression. Social isolation is another factor that can contribute to depression among university students. Financial stress is another cause of anxiety for many university students, particularly those who are supporting themselves or have limited financial resources. Studies have shown that financial difficulties can lead to depression and anxiety, as well as physical health problems such as headaches and stomachaches. Students who experience financial difficulties may be more likely to drop out of university, which can have long-term consequences for their mental health and wellbeing A study by Matthews et-al (2020) found that people who experienced financial strain were more likely to experience symptoms of depression, such as loss of interest, feelings of worthlessness, and changes in appetite or sleep patterns. Wajahat et-al. (2023) observes that Main causes of depression are Negligence in material or spiritual aspect of life, trials & tribulations, and disobedience to Allah Almighty.

It is observed that people with substance use disorders were more likely to be depressed. The study was based on a review of 75 studies involving more than 270,000 participants. In another study, published in the Journal of Clinical Psychiatry (2020). Studies reveal that psychological distress is prevalent among UNILORIN students. University students are people in their adolescent age that are on the line of endurance as a result of transition from adolescent to adulthood and this is one of the most stressful stages in human life. Trying to fit in among their peers, meet up with the societal expectations, maintain good grades, balance social life, being away from home for a long time and planning of future can be draining and hence, causes anxiety for a lot of students. Despite the availability of a counseling center, many students do not seek professional help due to stigma and preference for religious coping (Olatunji *et-al.,* 2024). The University of Ilorin's Islamic orientation offers unique protective factors for mental health. The campus environment promotes modesty, structured prayer routines, and availability of mosques and Islamic student associations. These elements create a spiritually supportive environment where students feel a sense of belonging (Yusuf &Sanni, 2023).

Research suggests that such faith-oriented environments contribute positively to resilience, social connectedness, and emotional balance (Ali & Abdullahi, 2022).

The Counseling and Human Development Centre at UNILORIN provides services in academic guidance, emotional counseling, and career advice. However, utilization remains low due to cultural stigma associated with mental health care (Olatunji et al., 2024). To address this, the university has collaborated with student unions, religious organizations, particularly Muslim Student Society of Nigeria (MSSN) and NGOs to organize mental health awareness campaigns. Scholars recommend integrating faith-based approaches into counseling services to ensure cultural sensitivity and higher uptake (Rassool, 2021).

Methodology

The research design for this study is descriptive with content analysis adopted for the study of the Qur'anic antidotes to the curtailment of depression. The target population comprised all undergraduate students of the University of Ilorin with total number of forty-nine thousand one hundred and fifty-three across sixteen (16) faculties. Simple random sampling of fish bowl balloting technique was used to select five (5) out of the fifteen (15) faculties in the University of Ilorin. Proportionate sampling technique was used to select six percent (6%) of the population of undergraduates of each of the five faculties selected which will be used as sample for the study. In the process of gathering information for this research, researcher designed structured questionnaire with the title: Prevalence, Causes and Health Implications of Depression Among Undergraduate Students of the University of Ilorin. This Questionnaire consists of two sections which are Section A and B. Section A contained demographic data of the respondents while section B focused on structured questions based on the postulated hypotheses. The reliability of this instrument was determined using split half technique. The reliability of the study was carried out by administering 20 questionnaires to the respondents in college of education, Ilorin, Kwara State, which was outside the area of study but share the same characteristics. The co-efficient of ''0.78'' was obtained using Cronbach Alpha for analysis. The researcher adopted the use of frequency and percentage to analyze and display the demographic information of the respondents and the research questions.

Results and Discussion

The data was collected on the prevalence, causes and health implications of depression among undergraduate students of the University of Ilorin, Nigeria. The data gathered were analysed using frequency and percentage to present the demography of the respondents. Research hypothesis 1, 2, 3, 4 and 5 were tested using chi-square at 0.05 level of significance using SPSS (Statistical Package for Social Science) version. The results are presented as follows:

Table 1: Demographic Data of the Respondents Involved in the Study Based on Age

Age	Frequency	Percentage
15-30 Years	437	97.1%
31-45 Years	8	1.8%
46-60 Years	5	1.1%
Total	450	100.0

Results in the Table 1 reveals that out of 450 respondents sampled for this study, 437(97.1%) of the sampled respondents are within age bracket of 15-30 years of age, only 8(1.7%) of the respondents sampled are within the age bracket of 31-45 years of age while 5(1.2%) of the sampled respondents are within age bracket of 46-60 years of age. This implied that 15-30 age bracket were the majority of the respondents sampled for this study.

Table 2: Demographic Data of the Respondents Involved in the Study Based on Gender

Gender	Frequency	Percentage (%)
Male	207	46.0%
Female	243	54.6%
Total	450	100.0

Results in the Table 2 reveals that out of 450 respondents sampled for this study, 207(46.0%) of the sampled respondents are male while 243(54.6%) of the sampled respondents are undergraduate female students of the University of Ilorin, Ilorin, Nigeria. This implied that undergraduate female students 243(54.6%) of the University of Ilorin, Ilorin, Nigeria are majority sampled for this study

Table 3: Demographic Data of the Respondents involved in the Study Based on Years of Study

Years of Study	Frequency	Percentage
First Year	157	34.0%
Second Year	82	18.2%
Third Year	100	22.2%
Fourth Year	25	5.6%
Other Year	86	19.1%

Total	450	100.0

Results in the Table 3 reveals that out of 450 respondents sampled for this study, 157(34.0%) of the respondents sampled are within the first year of their study and 82(18.2%) of the respondents sampled for this study are within the second year of their study. The table 3 further revealed that 100(22.2%) of the respondents sampled for this study are within their third year of study and only 25(5.6%) of them are within the fourth-year stages of their study. While, 86(19.1%) of the respondents sampled for this study are in other year of their study in the University of Ilorin, Ilorin. It implied that majority of the respondents sampled 157(34.0%) for this study are within the first year of their study.

Table 4: Demographic Data of the Respondents involved in the Study Based on Living Arrangement

Living Arrangement	Frequency	Percentage (%)
On Campus	363	80.7%
Off Campus	87	19.3%
Total	450	100.0

Results in the Table 4 reveals that out of 450 respondents sampled for this study, 363(80.7%) of the sampled respondents are living within the University campus while 87(19.3%) of undergraduate students of the University of Ilorin, Ilorin sampled for this study are living outside the University campus. This implied that majority of undergraduate students of University of Ilorin sampled for this study are living within the University campus.

Research Hypotheses Testing

Haven examined the demographic data of the respondents involved in the study and research questions. The researcher proceeded to test the null hypotheses generated using Chi-squares at 0.05 level of significance

Research Hypothesis One: Depression is not significantly prevalent among the students of University of Ilorin

Research Hypothesis One on a Chi-square Analysis of Prevalent Depression among the Students of University of Ilorin**,** the data reveal a chi-square analysis showing significant prevalence depression among the students of University of Ilorin, Ilorin. The table shows a calculated chi value of 1360.3 with 2 degrees of freedom computed at 0.05. Since the sig value (.000) is

lesser than 0.05, hypothesis 1 is rejected while alternative hypothesis is accepted. Therefore, it is affirmed that there is significant prevalent depression among the students of University of Ilorin. Based on this findings, it was established that there is high level of prevalent depression among the students of University of Ilorin.

Research Hypothesis Two: Academic workload will not significantly be a cause of depression among the students of University of Ilorin

Research Hypothesis Two on Academic workload not significantly being a cause of depression among the students of University of Ilorin, Result reveals a chi-square analysis showing significant cause of depression among the students of University of Ilorin by academic workload. The table shows a calculated chi value of 4536.213 with 1 degrees of freedom computed at 0.05. Since the sig value (.000) is lesser than 0.05, hypothesis 2 is rejected while alternative hypothesis is accepted. Therefore, academic workload is significantly cause depression among the students of University of Ilorin. It implied that academic workload is one of the main causes of depression among the students of University of Ilorin.

Research Hypothesis Three: Financial problem is not significantly a cause of depression among the students of University of Ilorin.

Research Hypothesis Threeon Financial problem not significantly being a cause of depression among the students of University of Ilorin. The result reveals a chi-square analysis showing financial factor as significant cause of depression among the students of University of Ilorin. The table shows a calculated chi value of 12718.571 with 1 degrees of freedom computed at 0.05. Since the sig value (.000) is lesser than 0.05, hypothesis 3 is rejected while alternative hypothesis is accepted. Therefore, there is significant cause of depression among the students of University of Ilorin by financial factor. As a result of this, it was implied that financial factor is a major cause of depression among the students of University of Ilorin.

Research Hypothesis Four: Stress will not significantly lead to depression among the students of University of Ilorin

Research Hypothesis four on stress as a cause of depression among students in the university of Ilorin reveals a chi-square analysis showing significant cause of depression among the students of University of Ilorin by the stress.

The table shows a calculated chi value of 6593.245 with 1 degrees of freedom computed at 0.05. Since the sig value (.000) is lesser than 0.05, hypothesis 4 is rejected while alternative hypothesis is accepted. Therefore, there is significant depression among the students of University of Ilorin as a result of stress. As a result of this, it was implied that stress is a significant cause of depression among the students of University of Ilorin.

Research Hypothesis Five: Depression will not significantly lead to suicide among the students of University of Ilorin.

Research Hypothesis Five on Depression not significantly leading to suicide among the students of University of Ilorin. Results of the analysis reveal a chi-square analysis showing depression as a significant factor that led to the suicide among the students of University of Ilorin. The table shows a calculated chi value of 105290.479 with 2 degrees of freedom computed at 0.05. Since the sig value (.000) is lesser than 0.05, hypothesis 5 is rejected while alternative hypothesis is accepted. Therefore, depression is a significant factor that led to suicide among the students of University of Ilorin. Based on the findings of this study, it was implied that depression is a significant factor that led to suicide among the students of University of Ilorin.

Islamic perspective on mental health: Islam provides a comprehensive framework for addressing psychological distress. Islamic teachings emphasise the balance between physical, emotional, and spiritual health, offering guidance on how to cope with mental challenges, including depression. Islam recognises that human beings experience emotional highs and lows, and the Quran and Hadith acknowledge feelings such as sadness, anxiety, and distress. Allah says; And We will surely test you with something of fear and hunger and a loss of wealth and lives and fruits, but give good tidings to the patients(Quran 2:155).As-Sharawi (1997) posited that the highest of the trial is the loss of life of individuals. It is when one still survives this highest trial that he will be confronted with others among which are fear and hunger. The Qur'an and Hadith offer guidance on managing psychological distress. Notably, the Qur'an reassures believers that difficulties are temporary:(Qur'an 94:5–6 and Qur'an 13:28). The Hadith complements these Quranic teachings by encouraging both spiritual and medical treatment. The Prophet Muhammad (peace be upon him) stated: "Make use of medical treatment, for Allah has not made a disease without appointing a remedy for it" (Bukhari, Hadith No. 5678). This further shows that depression should not be dismissed as a purely

spiritual issue but managed holistically through faith and professional support. Contemporary Islamic psychology emphasizes *dhikr, dua*, and reflection as therapeutic tools, alongside counseling and medical interventions. Rassool (2021) opines that integration of Islamic principles into modern psychotherapy enhances cultural sensitivity and reduces barriers to treatment, especially among Muslim populations.

When one remains steadfast, the Quran reminds him that the Hereafter is free from all negative experiences and feelings (43:68, 46:13). Throughout the Quran, these emotions are acknowledged, and, by extension, depression is acknowledged. As a part of this article, we examine the Quran's treatment of strong emotions, including grief and sorrow, and we draw lessons from these

Allah says regarding having faith and persevering "So do not weaken and do not grieve, and you will be superior if you are [true] believers." (3:139). The early Muslims of Medina were consoled in this verse following a defeat caused by their decisions and the turmoil they experienced in the battle of Uhud. The rumors that the Prophet (PBUH) had been martyred even caused some distress. As a result, they were unable to function effectively. This was a time of discontentment and sorrow for the early Muslims. (Al Baghawy, 1997) As Sharawy (1418) observed the condition of faith that ends the verse was provided as a solution to their discontentment and sorrow hence, faith is a remedy to depression

The Qur'an emphasizes that the presence of Allah provides solace. Allah says:

> *"And let not their speech grieve you. Indeed, honor [due to power] belongs to Allah entirely. He is the Hearing, the Knowing." (10:65).*

Interpreting this verse, Qurtubi (1964) explains that the power to overcome all stresses lies with Allah. This verse is a profound consolation and reminder revealed to the Prophet Muhammad (PBUH) in the face of ridicule, rejection and verbal abuse from his enemies. The verse caries timeless lessons for believers who encounter hostility, mockery or discouragement in their journey in life. This verse alleviate the worries of the prophet and strengthen his confidence thereby, relieving him of any depression.

Allah emphasizes that man should consistently seek help through patience and prayer. The Qur'an reads: "O you who have believed, seek help through

patience and prayer. Indeed, Allah is with the patient."(2:153). Our relationship with Allah is one of the most effective ways of feeling calm internally and externally. This verse emphasizes two central tools of spiritual strength: patience and prayer. When a Muslim is patience and he prays, he feels relief from stress and the hardships of life and his mind and heart feel relaxed.

A Muslim is enjoined to be optimistic of a positive outcome in the end of every endeavor 35:34. This verse explains that it is a fact of life that no one is immune to concerns, anxieties, or sorrows and so, Allah will remove all anxieties and sorrows from the people of heaven. By implication, those on earth shall have their sorrows removed for them only by Allah and sorrows in this verse, refers to all forms of distress and concern(At-Tabari,2000)

Equally relevant as Qur'anic antidote to depression is the verse that established the fact that whatever man is faced with are within his ability of overcoming. Allah say: لَا يُكَلِّفُ اللَّهُ نَفْسًا إِلَّا وُسْعَهَا meaning "Allah does not burden a soul beyond that it can bear (2:286)' In the course of life, we are often faced with hardships. There will be a testing of patience, devotion, and faith on the part of Allah (SWT). This verse explains that nobody is burdened with any difficulties in which they are physically or mentally incapable of bearing. This implies that whatever challenge one faces, it is a trial which Allah is confidence that man shall overcome and so, man should not allow such trial or challenge to overwhelm him.

Anybody that puts his trust in Allah will always find Allah sufficient for him. The Qur'an is equivocal on this when Allah says:… وَمَنْ يَتَوَكَّلْ عَلَى اللَّهِ فَهُوَ حَسْبُهُ … meaning "Whoever puts his trust in Allah; He will be enough for Him". (65:3) The beauty of Islam as contained in this verse lies in its ability to allow one to trust Allah (SWT). You must believe that Allah's plan for you is the best one possible. Al Tha'labi (2002) interprets this verse to mean that a Muslim should put his trust in Allah in whatever difficult situation he finds himself believing well that Allah is the architect of his life. This trust will elevate distress and worries from him. After every hardship and difficulty, mankind is promised ease and relief (94:6). This verse is a profound reassurance from Allah that difficulties in life are never permanent.

In Allah's guidance and trust lies fulfilling wisdom. Allah says: No misfortune ever befalls except by permission of Allah. And whoever has faith in Allah –

He will guide his heart. And Allah is Knowing of all things (64:11) This verse highlights the central Islamic teaching that everything in existence, either good or bad, occurs by the will and wisdom of Allah. Allah (SWT) has the ultimate. Every action of His has a purpose, whether to strengthen or bring us closer to Him. Believing that your destiny is in your best interest is the key to trusting Him.

Conclusion and Recommendation

Islamic perspectives on mental health emphasise patience, resilience, and reliance on Allah, offering a holistic approach that addresses both psychological and spiritual needs. The case of the University of Ilorin demonstrates how an Islamic environment can promote student well-being through communal support, structured worship, and religious associations. Nonetheless, challenges such as underutilization of counseling services and persistent stigma remain. Bridging the gap between Islamic coping mechanisms and professional counseling through integrative models could strengthen mental health outcomes for students.

Findings obtained from this study are summarised in the following;

1. It was established that there is high level of depression among the students of University of Ilorin.
2. It was also implied that academic workload is one of the main causes of depression among the students of University of Ilorin.
3. It was established that financial factor is also a major cause of depression among the students of University of Ilorin.
4. The research further revealed that stress is a significant cause of depression among the students of University of Ilorin.
5. Lastly, depression is observed as a significant factor leading to suicide among the students of University of Ilorin.

On a final note, these this paper recommends adherence to Islamic teachings in patience, resilience, and reliance. The Qur'an has recommended solution to our mental health problem in constant remembrance of Allah in Qur'an 13:28

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Constructivist based Digital Game Learning Environment: Trajectory towards enhancing upper primary science learners' performance in Energy transformation concepts

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Abstract

The need for a digital and innovative teaching approach arises from its ability to enhance learner engagement, foster critical thinking, and prepare learners with the skills especially in the upper primary school required as a baseline in a technology-driven society. This study therefore seeks to investigate the effectiveness of a constructivist-based Digital Game-Based Learning (DGBL) environment in enhancing upper primary school learners' performance energy transformation concepts. Two research questions raised and two Hypotheses were tested for the study. Quasi-experimental research design, using a non-randomization pretest-posttest experimental control groups was employed for the study. A sample size of 247 upper primary (5) learners using the purposive sampling was selected. The instrument for data collection was the Energy transformation Performance Test with a reliability index r = 0.91. Data obtained for the study were analyzed using frequency count, mean and standard deviation specifically for the research question while the Analysis of Variance (ANCOVA) was used to test the hypotheses at 0.05 level of significance and a Post Hoc test of Least Significant Difference (LSD). The findings of the study indicated that learners exposed to the constructivist-based DGBL strategy (performance = 79.1%, retention = 19.7%) demonstrated considerably greater gains in performance and retention compared to their counterparts taught through traditional methods (performance = 30.7%, retention = 14.6%). The results revealed a significant main effect of instructional method on performance, $F(1, 245) = 88.01$, $p < .001$, $\eta^2 = .26$ and a significant effect of instructional method on retention, $F(1, 245) = 44.53$, $p < .001$, $\eta^2 = .15$. Science teachers should undergo continuous professional development to strengthen their technical and pedagogical capacity for integrating constructivist digital game resources into instruction, curriculum developers and policymakers incorporate constructivist digital game-based learning into upper primary science curriculum to improve learners' comprehension and retention of abstract concepts among others.

Keywords*:* Constructivist, Digital Game Learning, Learners, Science, Upper Primary

Introduction

Upper primary science teaching and learning plays a vital role in equipping learners with foundational scientific literacy, which is essential for understanding the natural world and solving real-life problems. At this stage, learners are introduced to basic concepts in physics, chemistry, and biology that serve as the building blocks for more advanced studies. Science education at this level not only emphasizes knowledge acquisition but also develops inquiry skills, critical thinking, and curiosity about everyday phenomena (Achor et al., 2021). By engaging learners in hands-on and minds-on activities, upper primary science helps them to make sense of their immediate environment and prepares them for active participation in a technology-driven society (Okebukola, 2020). Science teaching and learning in Upper primary is crucial for providing students with essential scientific literacy, which is necessary for the understanding of the natural world and addressing real-life challenges. During this phase of science learning, learners are introduced to fundamental concepts in physics, chemistry, and biology that act a baseline for more advanced studies. Science teaching and learning at this level not only focuses on the acquisition of knowledge but also fosters inquiry skills, critical thinking, and a sense of curiosity regarding everyday occurrences (Aderonmu & Adolphus. 2023). By involving learners in both hands-on and minds-on activities, studies in upper primary science enables them to understand their immediate surroundings and equips them for active engagement in a technology-oriented society (Fior, 2025).

Evidently, science learning in upper primary school also provides the background for the cultivation of scientific attitude and problem solving essential for national development. Learners who develop scientific literacy at an early age are more equipped to grasp intricate ideas in secondary education and thereafter. Research indicates that early exposure to scientific concepts improves students' ability to utilize knowledge in different situations, encourages continuous learning, and fosters innovation (Jegede & Oyedeji, 2022). Therefore, enhancing science learning during this crucial phase is essential for cultivating a generation that can tackle societal issues through scientific reasoning and well-informed decision-making.

Understanding of the concepts of energy transformation is essential for cultivating scientific literacy, as it allows students to explain natural occurrences and technological mechanisms in their daily lives. Ideas such as the conversion from potential energy to kinetic energy, or the transformation

of light energy into heat energy, lay the baseline for understanding the operation of machines, electrical devices, and biological systems. Achieving mastery in these concepts is vital not only for success in sciences but also for enhancing problem-solving abilities that can be utilized in practical situations, including energy conservation and sustainable development (Nwosu & Okeke, 2021). An early understanding of energy transformation provides students with the capability to link theoretical concepts to real-world applications, thus fostering enthusiasm for STEM-related disciplines. Despite its significance, the concept of energy transformation is frequently perceived as abstract and challenging for upper primary students. This challenge stems from the fact that many students find it difficult to conceptualize energy as an invisible force that transitions between various forms, particularly when these transformations are not readily observable (Adegboye & Ogunleye, 2020). Misconceptions, such as the notion that energy is "used up" instead of being transformed, often impede learners' comprehension of the concept. Furthermore, the dependence on teacher-centered methodologies that prioritize rote learning over exploration and experimentation restricts students' capacity to grasp the concepts effectively (Cairns & Long, 2025). These obstacles highlight the necessity for innovative, interactive, and constructivist approaches such as the digital game-based learning that can render abstract energy concepts more tangible, engaging, and relevant.

In Nigeria, science teaching is predominantly reliant on lecture-based, teacher-centered strategies, where the teacher serves as the primary source of information and learners are merely passive recipients. Instruction typically focuses on rote memorization of scientific facts, definitions, and formulas, rather than encouraging inquiry, experimentation, or problem-solving (Komen et al., 2025). Although this method may assist students in recalling information for tests, it seldom cultivates critical thinking, creativity, or a profound understanding of concepts. Consequently, abstract ideas such as energy transformation are presented in a manner that separates theory from practical applications, resulting in students developing misconceptions and a superficial grasp of knowledge. The absence of learner-centered activities, along with inadequate instructional resources, restricts opportunities for engagement, exploration, and the development of meaningful scientific understanding (Abdullahi & Ibrahim, 2020).

In contrast, learners centered approaches place emphases towards the learners; their requirements, their learning processes, and the environment in which they acquire knowledge. Central to this transition are practices such as active learning, formative assessment, personalized instruction, collaboration, and opportunities for students to reflect, make decisions, and participate in self-regulated learning. For instance, Schendela et al., (2023) illustrated how learner-centered pedagogy prioritizes critical thinking, problem-solving, and skills for lifelong learning, transcending the conventional teacher-centered model. Likewise, in distance-learning settings, the combination of technology with learner-centered strategies has been demonstrated to enhance student engagement and adaptability. Several research scholars have identified benefits of the learner-centered approach which are;

1. Encourages Active Participation: Learner-centered methodologies establish interactive settings in which learners actively participate in the construction of knowledge instead of merely being passive recipients. This involvement enhances comprehension and promotes the long-term retention of educational outcomes (Ahmed et al., 2022).
2. Enhances Critical Thinking and Problem-Solving Skills: By emphasizing inquiry and real-life application, learner-centered teaching enables learners to develop critical thinking and problem-solving competencies, which are often limited in teacher-centered classrooms (Gcabashe, 2024).
3. Supports Autonomy and Self-Regulated Learning: In learner-centered environments, students assume responsibility for their own learning, thereby enhancing their capacity to establish goals, monitor their own progress, and reflect on their achievements. Aderonmu and Abraham (2021) discovered that these contexts greatly enhance self-regulated learning strategies.
4. Promotes Collaboration and Communication: Engaging in group activities and peer interactions within learner-centered methodologies fosters collaboration, teamwork, and communication abilities, equipping learners for the requirements of both academic settings and the workplace (Yi, 2016).
5. Enhances Motivation and Personal Significance: When education is customized to meet the needs and experiences of learners, learners exhibit increased motivation and involvement. Recent research in higher education emphasizes that learner-centered teaching renders

content more significant and promotes attitudes conducive to lifelong learning (Ahmed et al., 2022).

In recent years, advancements in digital technology have significantly transformed the educational landscape, providing new tools and methodologies to enhance both teaching and learning. Technologies such as e-learning platforms, virtual simulations, mobile learning, and artificial intelligence have broadened access to information and fostered more interactive and engaging environments for students. These innovations are in line with global demands for 21st-century education, which prioritizes creativity, critical thinking, collaboration, and problem-solving (Hermann & Allison, 2022). By incorporating digital tools into their teaching practices, educators are progressively shifting from traditional rote learning to more dynamic, student-centered methods that promote deeper understanding and skill development.

Among these innovations, Digital Game-Based Learning (DGBL) has emerged as a particularly powerful tool. Digital game-based learning (DGBL) has transitioned from being merely as an incentive augmentation to a deeply grounded pedagogical landscape that resonates in several spectrums of research activities that facilitates active, contextual and social knowledge construction, a roadmap to constructivist theory. Hadwen-Bennett and Economou (2019) stated that the evolving position of Digital Game Based Learning (DGBL) as transcend from mere entertainment to edutainment that emphases the progressive development of cognitive structures and learner's mental models. DGBL integrates educational content into digital games, combining the motivational aspects of play with structured learning objectives. Unlike traditional methods that often prioritize memorization, DGBL engages learners through interactivity, feedback loops, and immersive environments that stimulate curiosity and persistence (Fiorella, 2018). By embedding learning goals within game mechanics, learners acquire knowledge and skills in a manner that feels meaningful and enjoyable, thereby bridging the gap between entertainment and education.

Constructivism is a theory of learning that highlights the active participation of learners in the creation of their own knowledge by connecting new information with their previous experiences. Okoli and Eze (2022) asserted that constructivism emphasizes the importance of collaboration and social interaction in the process of knowledge construction, wherein learners

collaboratively create meaning through dialogue, peer learning and guided discovery. Instead of perceiving learners as mere passive recipients of information, constructivism views learning as a process of inquiry, reflection, and meaning-making influenced by learners' interactions with their surroundings (Achor & Orji, 2021). In the context of science teaching and learning, this methodology shifts the emphasis from rote memorization to exploration, enabling learners to partake in both hands-on and minds-on activities that enhance their understanding. For example, when learners are encouraged to experiment with or simulate real-life situations involving energy transformation, they actively construct concepts that become more significant and enduring. This theory holds particular significance for upper primary science learners as it connects abstract concepts with everyday experiences, thus rendering science more relevant and engaging. By placing learners at the core of the educational process, strategies informed by constructivism assist in addressing prevalent misconceptions, enhancing critical thinking, and nurturing scientific problem-solving abilities that transcend the classroom (Adeyemi, 2023).

The constructivist approach aligns strongly with the use of Digital Game-Based Learning (DGBL), as both emphasize active participation, exploration, and knowledge construction. In a game-based environment, learners are not merely passive observers but take on roles that require decision-making, problem-solving, and experimentation. These interactive experiences provide opportunities for learners to test their ideas, receive immediate feedback, and refine their understanding, which are key principles of constructivist learning (Okeke & Nwachukwu, 2022). By engaging learners in meaningful tasks within virtual simulations or games, DGBL offers a constructivist-driven platform where abstract science concepts can be made concrete and more accessible. Qian and Clark (2016) noted that a more nuanced understanding of the relationship between constructivist pedagogy and game design can ensure that DGBL moves beyond being a motivational tool to becoming a legitimate medium for deep, meaningful learning. Simplified steps required in using a constructivist approach with DGBL to enhance academic performance include;

1. Identify Learning Objectives: Begin by aligning the digital game with specific curriculum goals. This ensures that the game experience goes beyond entertainment and directly supports academic achievement.

2. Select or Design Appropriate Games: Choose games that promote exploration, inquiry, and problem-solving in authentic contexts. Games should challenge students to apply knowledge actively rather than passively consume content.
3. Integrate Scaffolding and Guidance: Provide hints, feedback loops, or structured challenges within the game to guide students through complex tasks. Scaffolding helps learners gradually build mastery while maintaining engagement.
4. Facilitate Collaboration and Interaction: Encourage group play or peer-to-peer collaboration, allowing students to share ideas, solve problems collectively, and construct knowledge socially which is the core to constructivist learning.
5. Encourage Reflection and Assessment: After gameplay, engage students in reflective discussions, journaling, or peer review to help them analyze strategies, connect experiences to prior knowledge, and transfer learning beyond the game context.

When utilized in upper primary science teaching and learning, especially in the context of teaching energy transformation, constructivist-based Digital Game-Based Learning (DGBL) offers an innovative approach to overcoming persistent learning challenges. For instance, digital games can illustrate how potential energy is converted into kinetic energy through everyday examples, such as a ball rolling down a hill, or how light energy is transformed into heat energy when absorbed by various materials. These visual and interactive experiences enable learners to link abstract concepts with real-world situations, thus addressing prevalent misconceptions and improving conceptual comprehension (Adebayo & Yusuf, 2023). By placing learners at the forefront of the educational process, constructivist-driven DGBL not only enhances understanding of energy concepts but also fosters curiosity, engagement, and the long-term retention of scientific knowledge.

Statement of problem

Despite the acknowledged significance of science teaching and learning in fostering foundational scientific literacy, numerous upper primary learners still face challenges in comprehending energy transformation concepts. Abstract notions, such as the shift from potential to kinetic energy or the conversion of light energy into heat, are frequently difficult for young learners to visualize and connect with their daily experiences. Research indicates that these

challenges are enduring, resulting in misconceptions like the belief that energy is 'used up' instead of transformed. Such misconceptions not only impact learners' immediate understanding of science but also obstruct their capacity to build upon these concepts in advanced educational settings.

The issue is further exacerbated by the ongoing dependence on traditional teacher-centered approaches in Nigerian classrooms and similar environments. Instruction is often characterized by rote memorization, lecture-based teaching, and an emphasis on examination performance rather than on conceptual comprehension. Consequently, students frequently underperform in science evaluations and lack the critical thinking abilities essential for applying scientific principles in real-world situations. Evidence indicates that when abstract ideas like energy transformation are taught without interactive or experiential learning methods, students retain only superficial knowledge and continue to demonstrate misconceptions that persist throughout their educational journey.

In light of these challenges, there is a distinct necessity to investigate innovative instructional methods that enhance the engagement, interactivity, and significance of science teaching and learning. A constructivist-oriented Digital Game-Based Learning (DGBL) environment presents such an opportunity by enabling learners to actively build knowledge through exploration, experimentation, and problem-solving within gaming contexts. By offering visual simulations and interactive feedback, DGBL can assist learners in gaining a deeper understanding of energy transformation processes while rectifying misconceptions and enhancing academic performance. This integration not only corresponds with global trends in science education but also tackles local challenges, thereby equipping learners for improved success in science and greater preparedness for future STEM endeavors.

Aim and objectives of the study

The aim of this study is to investigate the effectiveness of a constructivist-based Digital Game-Based Learning (DGBL) environment in enhancing upper primary school learners' performance energy transformation concepts. Specifically, the objectives of the study are to;

1. determine upper primary school learners' pretest and posttest mean performance in the concept of Energy Transformation when taught

with Constructivist Approach using Digital Game-Based Learning and those taught with the traditional teaching method.

2. investigate upper primary school learners' mean retention level on the concept of Energy Transformation when taught with Constructivist Approach using Digital Game-Based Learning and those taught with the traditional teaching method.

Research Questions

The following research questions were raised for the study.

1. What is the difference between upper primary school learners' pretest and posttest mean performance in the concept of energy transformation when taught using the constructivist approach with Digital Game-Based Learning and those taught using the traditional teaching method?
2. What is the difference in the mean retention level of upper primary school learners on the concept of energy transformation when taught using the constructivist approach with Digital Game-Based Learning and those taught using the traditional teaching method?

Hypotheses

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

Ho_1: There is no significant difference between upper primary school learners' pretest and posttest mean performance in the concept of energy transformation when taught using the constructivist approach with Digital Game-Based Learning and those taught using the traditional teaching method.

Ho_2: There is no significant difference in the mean retention level of upper primary school learners on the concept of energy transformation when taught using the constructivist approach with Digital Game-Based Learning and those taught using the traditional teaching method.

Methodology

The research design employed for the study was the quasi-experimental research design, using a non-randomization pretest-posttest experimental

control groups. The population of the study comprised of 3,611 (Basic 5 learners) in upper primary schools (Schools records, 2025) in Ijebu-Ode Local Government Area of Ogun State, Nigeria. Using a purposive sampling technique, 247 Basic 5 learners in upper primary schools were selected for the study. Two schools were used for the study and four intact classes were employed in all having two in each school.

Table 1: Showing sample size of learners for the study.

School	Group	No. of Male	No. of Female	Total
A	Experimental Group (CGBL)	61	57	118
B	Control Group (TTM)	58	71	129
	Total	119	128	247

Source: Researchers' field work, 2025.

The instrument for data collection developed by the researchers was titled "Energy transformation Performance Test" (ETPT). Energy transformation Performance Test consisted of 20 short fill-in-the-blank objective questions on the concept of Energy Transformation (Sun and Plants, Home and Community, electricity and Machines) which is suitable for Basic 5 (Upper Primary School) level and are aligned with the Upper Primary School curriculum. In scoring, each test item is scored 5 marks making a total of 100 marks that is equivalent to 100%. Other instruments developed included the Instructional Lesson packages of;

(1) Constructivist Game Based Learning that has

1. Instructional Lesson note covering two week
2. Teachers' checklist
3. Learners worksheet and
4. Digital game cards (Each card has a Scenario + **a** Prompt**.** Print, cut, and shuffle).

(2) Traditional Teaching Instructional Package

The instrument for data collection Energy transformation Performance Test was validated by experts in Measurement and Evaluation, Educational Technology and Science Education. Their constructive inputs were thoroughly adhered to in ensuring an ideal test item for the study. Furthermore, the instrument was subjected a pilot study in order to achieve the reliability index of the instrument. The instrument was administered to twenty (20) Basic 5

learners in upper primary schools but was not part of the selected learners for the main study. The data obtained from the pilot study was analyzed using the Kuder-Richardson-21 coefficient statistics was and a reliability coefficient value of r= 0.91 was obtained making the instrument 91% reliable for use.

The procedure for data collection was categorized into five phases (Pre-pretest Phase, Pretest Phase, Intervention Phase, Posttest Phase and Post-Delayed Test Phase).

The Pre-pretest Phase: This phase consisted of familiarization with school management, science teachers and learners involved for the study. Specifically, the science teachers will be trained in line with the objectives of the study. The science teacher for school A (Constructivist Game Based Learning) will be trained on how to set up the constructivist classroom learning environment, how to use the teachers' checklist, administration and how the students will use the worksheet and to play the Game cards to obtain correct answers. The science teacher for school B (Traditional Teaching Method) will also be trained based on the objective of the study.

The pretest Phase: This phase involved the administration of the pretest item (Energy transformation Performance Test) to the learners.

The intervention period: This phase was focused on the actual procedure of instructional facilitation by the science teachers based on the two different instructional strategies employed for the study. The intervention period lasted for two weeks in accordance to the topic and the school time table.

The Posttest Phase: The posttest phase involved the administration of the test item (Energy transformation Performance Test) to the learners immediately after the completion of the intervention.

The Post-Delayed Test Phase: The Post-Delayed Test phase was done to achieve the retention rate of the learner after the posttest had been administered. The Post-Delayed Test administered was still the test item (Energy transformation Performance Test) but reshuffled and administered to the learners three weeks after the posttest was administered to them.

The data collected for the study were analyzed using frequency count, mean and standard deviation specifically for the research question while the

Analysis of Variance (ANCOVA) was used to test the hypotheses at 0.05 level of significance and a Post Hoc test of Least Significant Difference (LSD).

Result

Research Question 1: What is the difference between upper primary school learners' pretest and posttest mean performance in the concept of energy transformation when taught using the constructivist approach with Digital Game-Based Learning and those taught using the traditional teaching method?

Table 2: Showing learners' performance on concept of energy transformation based on the instruction strategies.

Groups	Test	No	Mean	Mean Gain	% Mean Gain
Experimental Group (CGBL)	Pretest	118	35.8	28.3	79.1
	Posttest		64.1		
Control Group (TTM)	Pretest	129	36.2	11.1	30.7
	Posttest		47.3		

Source: Researchers' field work, 2025.

An analysis of the pretest and posttest scores was conducted to compare the performance of upper primary school learners taught energy transformation concepts using the constructivist approach with Digital Game-Based Learning (CGBL) and those taught with the traditional teaching method (TTM). As presented in Table 2, the experimental group (CGBL) recorded a pretest mean score of 35.8 and a posttest mean score of 64.1, yielding a mean gain of 28.3 and a percentage mean gain of 79.1%. In contrast, the control group (TTM) had a pretest mean of 36.2 and a posttest mean of 47.3, resulting in a mean gain of 11.1 and a percentage mean gain of 30.7%. These findings suggest that while both groups showed improvement, learners exposed to the constructivist-based DGBL strategy demonstrated considerably greater gains in performance compared to their counterparts taught through traditional methods.

Research question 2: What is the difference in the mean retention level of upper primary school learners on the concept of energy transformation when taught using the constructivist approach with Digital Game-Based Learning and those taught using the traditional teaching method?

Table 3: Showing learners' mean retention level on concept of energy transformation based on the instruction strategies.

Groups	Test	No	Mean	Mean Gain	% Mean Gain
Experimental Group (CGBL)	Pretest	118	64.1	12.6	19.7
	Post-Delayed Test		76.7		
Control Group (TTM)	Pretest	129	47.3	6.9	14.6
	Post-Delayed Test		54.2		

Source: Researchers' field work, 2025.

To determine the difference in retention levels between students taught using the constructivist approach with Digital Game-Based Learning (CGBL) and those taught using the traditional teaching method (TTM), a post-delayed test was administered. As shown in Table 3, the experimental group (CGBL) had a pretest mean score of 64.1 and a post-delayed test mean score of 76.7, resulting in a mean gain of 12.6 and a percentage mean gain of 19.7%. On the other hand, the control group (TTM) recorded a pretest mean of 47.3 and a post-delayed test mean of 54.2, with a mean gain of 6.9 and a percentage mean gain of 14.6%. These results indicate that while both groups demonstrated some level of knowledge retention, the learners exposed to the constructivist-based DGBL strategy showed higher retention of energy transformation concepts compared to those taught through the traditional teaching method.

Hypotheses

Ho_1: There is no significant difference between upper primary school learners' pretest and posttest mean performance in the concept of energy transformation when taught using the constructivist approach with Digital Game-Based Learning and those taught using the traditional teaching method.

Table 4: Showing summary of ANCOVA on the difference between learners' mean performance

Source	SS	Df	MS	F	P	Eta²
Covariate (Pretest)	520.45	1	520.45	30.94	.000	.112
Group	1480.32	1	1480.32	88.01	.000	.264
Error	4120.87	245	16.82			
Total	6121.64	246				

Source: Researchers' field work, 2025.

An analysis of covariance (ANCOVA) was conducted to examine the effect of instructional method on upper primary school learners' posttest performance in the concept of energy transformation, while controlling for pretest scores. The results revealed a significant main effect of instructional method, $F(1, 245) = 88.01$, $p < .001$, $\eta^2 = .264$, indicating that learners taught using the constructivist approach with Digital Game-Based Learning (CGBL) significantly outperformed those taught with the traditional teaching method (TTM) after adjusting for initial differences. The effect size ($\eta^2 = .264$) suggests that approximately 26.4% of the variance in posttest scores was explained by the instructional method. Based on this result, the null hypothesis (Ho_1), which stated that there is no significant difference between the groups, was rejected.

Since a significant difference was obtained between the mean values of learners both in the constructivist approach with Digital Game-Based Learning (CGBL) and traditional teaching method (TTM), the direction of the significant difference was determined using the Post Hoc comparison of Least Significant Difference (LSD) test.

Table 5: Showing Post Hoc test of comparison of difference in mean performance score

Groups Compared	Mean Difference	Std. Error	p-value	Decision
CGBL vs. TTM	16.80	1.79	.000	Significant

Source: Researchers' field work, 2025.

A post hoc comparison using the Least Significant Difference (LSD) test as shown in Table 5 revealed that learners taught with the constructivist approach using Digital Game-Based Learning (CGBL) scored significantly higher on the posttest ($M = 64.1$) compared to those taught with the traditional teaching method (TTM) ($M = 47.3$), mean difference = 16.80, $p < .001$. This confirms that the superior performance observed in the ANCOVA analysis was attributable to the experimental group (CGBL).

Ho_2: There is no significant difference in the mean retention level of upper primary school learners on the concept of energy transformation when taught using the constructivist approach with Digital Game-Based Learning and those taught using the traditional teaching method.

Table 6: Showing summary of ANCOVA on the difference between learners' retention rate

Source	SS	Df	MS	F	p	Eta²
Covariate (Pretest)	410.28	1	410.28	18.62	.000	.071

Group	980.46	1	980.46	44.53	.000	.154
Error	5394.12	245	22.02			
Total	6784.86	246				

Source: Researchers' field work, 2025.

An analysis of covariance (ANCOVA) was conducted to determine the effect of instructional method on learners' retention of energy transformation concepts, while controlling for pretest scores as presented on Table 6. The results revealed a significant effect of instructional method on retention, $F(1, 245) = 44.53$, $p < .001$, $\eta^2 = .154$, indicating that students taught using the constructivist approach with Digital Game-Based Learning (CGBL) retained significantly more knowledge than those taught with the traditional teaching method (TTM). The effect size ($\eta^2 = .154$) suggests that approximately 15.4% of the variance in retention scores was explained by the instructional method. Based on this, the null hypothesis (Ho_2) was rejected.

The direction of the significant difference between the retention mean scores of constructivist approach with Digital Game-Based Learning (CGBL) and traditional teaching method (TTM) was further determined using a Post Hoc Post Hoc comparison of Least Significant Difference (LSD) test.

Table 7: Showing Post Hoc test of comparison of difference in retention mean scores

Groups Compared	Mean Difference	Std. Error	p-value	Decision
CGBL vs. TTM	22.50	2.32	.000	Significant

Source: Researchers' field work, 2025.

A post hoc comparison using the Least Significant Difference (LSD) test as shown in Table 7 indicated that learners taught with the constructivist approach using Digital Game-Based Learning (CGBL) retained significantly more knowledge of energy transformation concepts ($M = 76.7$) than those taught with the traditional teaching method (TTM) ($M = 54.2$), mean difference = 22.50, $p < .001$. This finding confirms the ANCOVA result that the constructivist-based digital game environment supported stronger long-term retention of science concepts compared to traditional methods.

Discussion

The results of this research indicated that upper primary school students who were instructed on energy transformation concepts through the constructivist approach utilizing Digital Game-Based Learning (CGBL) surpassed their

peers who were taught using the traditional teaching method (TTM). The experimental group recorded a mean gain of 28.3, with a percentage mean gain of 79.1%, in contrast to the control group, which had a mean gain of 11.1 and a percentage mean gain of 30.7%. This significant difference highlights the efficacy of CGBL in improving learners' conceptual comprehension and problem-solving abilities. This finding is consistent with earlier research that has shown that interactive and game-based learning strategies foster enhanced academic performance by engaging learners more actively than traditional methods (Klopfer & Thompson, 2020).

A key explanation for this improvement can be found in the constructivist framework that supports CGBL. Constructivism highlights the active involvement of learners in the process of knowledge construction by connecting new information to their previous experiences, which in turn promotes a deeper understanding (Deng, 2023). In the context of game-based learning, students are not merely passive recipients of information, rather, they are engaged participants who investigate, experiment, and evaluate their comprehension of scientific concepts such as energy transformation. Therefore, the results indicate that CGBL offers the necessary support for significant learning experiences in science teaching and learning.

The higher gains recorded by students in the experimental group also point to the motivational benefits of digital games. Studies have shown that game-based learning environments increase learners' attention, motivation, and interest, which are crucial for sustaining engagement in complex science topics (Jong, 2015). Energy transformation concepts, which often appear abstract when taught traditionally, become more relatable when presented through digital games that simulate real-world energy conversions. In this way, learners not only recall definitions but also visualize and apply the principles, thereby reducing misconceptions.

The findings highlight the limitations of traditional teaching methods (TTM), which rely heavily on rote memorization and teacher-centered instruction. While the control group demonstrated some improvement, the lower mean gain and percentage gain suggest that TTM is insufficient for fostering deep conceptual change in learners. This is consistent with prior research indicating that traditional methods often fail to correct misconceptions in science, leaving learners with fragmented knowledge (Obafemi & Aderonmu, 2022). In contrast, CGBL provides opportunities for repeated practice, immediate

feedback, and experiential learning, which together strengthen understanding and retention of scientific concepts. This study contributes to the growing body of evidence that constructivist-based digital game environments significantly enhance learning outcomes in science. The implication is that integrating CGBL into upper primary science instruction can improve learners' performance and bridge persistent gaps in scientific literacy. These findings echo the call for curriculum innovation and the adoption of learner-centered pedagogies in Nigerian classrooms and beyond (Odeyemi & Ajayi, 2021). By leveraging digital game-based platforms within a constructivist framework, teachers can transform difficult concepts like energy transformation into engaging and meaningful learning experiences.

The result of the ANCOVA confirms that the constructivist approach with Digital Game-Based Learning (CGBL) had a significant positive effect on students' performance in energy transformation concepts compared to the traditional teaching method (TTM). The finding that 26.4% of the variance in posttest scores was explained by instructional method underscores the effectiveness of constructivist-based digital environments in facilitating deep conceptual understanding. This is consistent with prior studies which have shown that interactive, learner-centered approaches such as game-based learning foster improved problem-solving skills and higher achievement in science learning (Low et al., 2024) The significant difference observed also validates the claim that traditional, teacher-centered strategies often limit learners' engagement and conceptual development, whereas constructivist digital tools provide experiential opportunities that promote meaningful learning outcomes.

The results of this research indicated that learners who engaged with the constructivist method utilizing Digital Game-Based Learning (CGBL) had a more effective retention of energy transformation concepts compared to those taught through the traditional teaching method (TTM). While both groups showed progress from the pretest to the post-delayed test, the experimental group achieved a higher mean gain of 12.6 and a percentage gain of 19.7%, in contrast to the control group, which had a mean gain of 6.9 and a percentage gain of 14.6%. This suggests that CGBL not only facilitated immediate learning but also contributed to the retention of knowledge over the long term. These findings align with previous studies that emphasize the effectiveness of

game-based learning environments in enhancing memory retention, as they integrate experiential activities with active participation (Cho et al., 2023).

The higher retention observed in the CGBL group can be linked to the constructivist principles integrated into the instructional design. Constructivism highlights the significance of learners actively building knowledge and relating new information to their previous experiences. In this research, digital games offered interactive, real-world simulations of energy transformations, enabling learners to practice and reinforce their understanding repeatedly. This type of experiential reinforcement diminishes misconceptions and aids in the development of stronger long-term memory consolidation (Obafemi & Aderonmu, 2023). In contrast, the teacher-centered method employed in the control group primarily depended on rote memorization, which typically diminishes over time, thereby accounting for the relatively lower retention rates.

These findings are consistent with previous research that highlights the motivational advantages of digital games for ongoing learning. Strategies based on games offer immediate feedback, foster competition, and present challenges that keep learners engaged, thereby improving their ability to recall and apply knowledge even after the instruction has concluded. This indicates that implementing CGBL strategies in primary science classrooms can enhance learners' capacity to grasp intricate concepts such as energy transformation. As a result, incorporating digital games within a constructivist framework not only enhances short-term performance but also provides learners with lasting knowledge that underpins future scientific literacy.

The ANCOVA result showed that instructional method had a significant effect on students' retention of energy transformation concepts, with those exposed to the constructivist approach using Digital Game-Based Learning (CGBL) retaining significantly more knowledge than their peers taught with the traditional teaching method (TTM). The effect size ($\eta^2 = .154$) further highlights that instructional strategy accounted for a substantial proportion of the variance in retention scores, emphasizing the lasting impact of constructivist-driven digital games on learners' memory. This aligns with earlier findings that digital game-based environments not only improve immediate performance but also promote long-term knowledge retention by providing active engagement, immediate feedback, and meaningful contextual learning experiences (Kayode, et al., 2025).The result also supports the view

that traditional rote-based teaching often fails to sustain learners' conceptual understanding over time, whereas constructivist digital strategies foster durable and transferable knowledge (Appiah-Twumasi, et al., 2023).

Conclusion

This research investigated the efficacy of the constructivist method utilizing Digital Game-Based Learning (CGBL) in improving the performance and retention of energy transformation concepts among upper primary school learners. The results consistently indicated that learners who engaged with CGBL significantly surpassed their peers who were instructed through the traditional teaching method (TTM) in both immediate posttest results and delayed retention assessments. These findings illustrate that digital game environments based on constructivist principles offer learners more enriching and engaging opportunities to actively build knowledge, thus addressing ongoing difficulties in comprehending abstract scientific concepts.

The study confirmed that traditional teacher-centered instruction, while capable of yielding some enhancements, was less effective in promoting profound conceptual transformation and long-term retention. In contrast, the constructivist approach integrated within digital games facilitated meaningful learning by connecting new information with students' prior experiences and enabling repeated practice in interactive settings. This supports the notion that effective science education at the primary level necessitates innovative, learner-centered methodologies that transcend mere rote memorization and procedural instruction.

The integration of constructivist principles with Digital Game-Based Learning has significant implications for science teaching and learning in Nigeria and similar contexts. It offers a pathway to improve scientific literacy by equipping learners with both immediate comprehension and sustained understanding of complex topics like energy transformation. The findings call for curriculum planners, educators, and policymakers to embrace digital, constructivist-driven strategies as viable tools for enhancing performance and retention in science classrooms. Doing so can help bridge learning gaps, reduce misconceptions, and foster a generation of learners who are better prepared for future scientific inquiry and problem-solving. The combination of constructivist principles with Digital Game-Based Learning holds considerable significance for the teaching and learning of science in Nigeria

and comparable environments. It provides a means to enhance scientific literacy by enabling learners to achieve both immediate understanding and long-term grasp of intricate subjects such as energy transformation.

Recommendations

1. Science teachers should receive professional development and support to build the technical and pedagogical skills needed for effectively integrating constructivist-based digital game resources into classroom instruction.
2. Curriculum developers and policymakers should integrate constructivist-driven digital game-based learning into upper primary science to enhance learners' understanding, performance, and retention of abstract concepts like energy transformation.
3. Education stakeholders should provide schools with adequate digital infrastructure and resources to support effective implementation of constructivist game-based learning and enhance learners' engagement, performance, and retention.

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Challenges in Educational Monitoring and Supervision

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Abstract

The purpose of this paper is to examined the challenges in educational monitoring and supervisions. Both the monitoring and supervision are interdependent and interrelated. The relationship is symbolic one cannot function effectively without the other, they are expected to benefit each other in the use of school system, economic activities and acquisition of knowledge. This paper highlighted the need to link the monitoring and supervision into a cohesive that works effectively towards the achievement of mutually established goals. This paper comprehensive discussed the concept of monitoring, supervision and challenges in educational monitoring and supervision, for instance enhancing teaching and learning quality effective supervision provide continuous, formative feedback implementation. This paper revealed impact of poor monitoring and supervision, challenges do supervisors face in managing resistance from teachers during classroom observations as well as solution to overcoming challenges in educational monitoring and supervision. Parts of solution to overcoming challenges stated that, foster a culture of trust and collaborative growth; building trust is fundamental to reducing resistance and encouraging openness to feedback, supervisors should position themselves as partners in professional growth rather than solely as evaluators. The paper recommended by government and schools need dedicated, qualified experts in supervision. This requires appointing personnel with specialized training in education, administration and supervision and providing continuous professional development focused on pedagogical leadership and supportive mentoring, not just administrative control.

Keywords*:* Challenges, Educational, Monitoring, Supervision, School

Introduction

Educational monitoring and supervision constitute the foundational pillars of effective education systems, serving as critical mechanisms for ensuring quality, accountability, and continuous improvement. Monitoring involves the systematic collection, analysis, and use of data to track educational performance and progress towards predefined goals, such as student learning outcomes, teacher attendance, and resource distribution United Nations Educational Scientific and Cultural Organization UNESCO, (2017). Supervision, on the other hand, is a more formative process aimed at guiding, supporting, and professionally developing teachers and school leaders to enhance instructional practices and foster better educational results (Zubairi & Rose, 2021). In theory, these processes should function synergistically: monitoring identifies areas requiring attention, and supervision provides the necessary support to address these gaps. Yet, across diverse global contexts, the implementation of robust monitoring and supervision frameworks remains deeply challenging.

A multitude of interconnected obstacles hinder their effectiveness. Systemic and resource-related challenges are among the most pervasive, including inadequate funding, poor technological infrastructure, and logistical barriers that restrict regular and meaningful school visits, especially in remote or underserved regions (World Bank, 2018). This often results in a reliance on outdated, cumbersome data collection methods that prioritize quantitative metrics over qualitative insights, leading to information that is rarely utilized for actionable school improvement (Cheng & Moses, 2021). Human resource constraints further exacerbate these issues, as supervisors are frequently overburdened with large portfolios and lack specialized training in modern pedagogical coaching and mentorship techniques Oluoch, *et al.,* (2023). This capacity gap reinforces the persistent perceptual problem wherein supervision is viewed as a punitive, inspection-oriented exercise rather than a collaborative and developmental process, thereby eroding trust and triggering resistance among educators.

Additionally, political and policy instability can divert focus from long-term educational quality to short-term political gains, often resulting in fragmented reforms and misaligned priorities (Holloway, 2022). These multifaceted challenges collectively undermine the potential of monitoring and supervision, transforming them from instruments of empowerment into bureaucratic compliance rituals. This introduction highlights the urgent need to address

these barriers to unlock the transformative role of monitoring and supervision in achieving equitable and high-quality education for all.

Literature Review

Educational monitoring and supervision are critical for ensuring quality education, yet they face significant, interconnected challenges. A primary issue is the capacity and competency gap among supervisors. Many lack the specialized training required for effective pedagogical leadership, data-driven decision-making, and mentoring, often defaulting to traditional, compliance-oriented inspection methods rather than supportive, formative feedback (Ajani, 2022; Ogunniyi, 2021).

The sheer volume and complexity of data also present a major hurdle. While data collection has expanded, systems often struggle to transform this raw information into actionable intelligence for school improvement. This leads to a phenomenon where monitoring is an end in itself, overwhelming practitioners without informing classroom practice United Nations Educational Scientific and Cultural Organization UNESCO, (2021). Furthermore, inadequate resources and high workloads constrain effectiveness. Supervisors frequently manage vast geographical zones with insufficient logistical support, limiting the frequency and depth of school visits and fostering superficial evaluations (Adegbesan, 2021).

Finally, the socio-political context can impede objectivity. Political interference, corruption, and pressure to meet top-down targets may compromise the integrity of the supervisory process, discouraging honest reporting and undermining its developmental purpose (World Bank, 2018). The persistence of these challenges highlights the urgent need to re-conceptualize supervision from a bureaucratic exercise to a continuous, supportive professional development system backed by strategic investment in human and technological capacity

Concept of Educational Monitoring

Educational monitoring encompasses systematic processes to track and assess educational systems, programs, and outcomes. Traditionally, it is defined as the continuous oversight of an activity to ensure it adheres to planned arrangements United Nations Educational Scientific and Cultural Organization

UNESCO, (2017), focusing on compliance and the efficient use of inputs. A more modern, data-driven perspective defines it as the routine collection, analysis, and use of information to track progress towards educational goals and inform management decisions (World Bank, 2018). This operational view emphasizes using data for feedback and timely corrective action.

Beyond compliance and management, monitoring also serves an accountability function, providing transparent information to stakeholder's governments, donors, and the public on performance and results (OECD, 2019). Furthermore, a formative definition positions monitoring as a tool for improvement and capacity development. It involves creating feedback loops that enable educators and policymakers to refine teaching practices and policies, thereby enhancing learning outcomes and promoting equity (UNICEF, 2020). Thus, educational monitoring evolves from mere oversight to a critical, multi-faceted tool for management, accountability, and continuous improvement within education systems.

Concept of Educational Supervision

Educational supervision encompasses a spectrum of definitions, reflecting its evolution from oversight to professional development. Traditionally, it was defined as a hierarchical process of inspection and quality control to ensure teachers adhered to prescribed standards (Appiah, 2023). A more contemporary and prevalent definition characterizes it as a collaborative, formative process aimed at improving instruction and enhancing teacher growth through reflective dialogue, coaching, and feedback (Zepeda, 2019; Glanz & Neville, 2021). From a transformational leadership perspective, supervision is the work of cultivating a professional learning community where educators collectively analyze practice and student data to promote equity and school-wide improvement (Harris & Jones, 2019). Some scholars also define it through a critical-theory lens, viewing supervision as a political act that can either perpetuate or challenge systemic inequities, thus framing it as a practice for advocating social justice within curricula and instructional methods (Alston & Trent, 2020). These differing definitions highlight that supervision is not a monolithic concept but a multifaceted practice whose meaning is shaped by its underlying purpose be it accountability, development, or transformation.

Theoretical Framework

The Instructional Leadership theory was primarily developed by Philip Hallinger and Joseph Murphy in the 1980s, posits that effective school leaders prioritize teaching and learning quality. Its profound assumption is that the most critical path to school improvement is through direct, ongoing support for instructional practice, not administrative oversight. When applied, this theory directly addresses core supervision challenges by transforming the supervisor's role from inspector to instructional coach. This shift reduces teacher resistance and fosters a collaborative culture focused on professional growth, thereby enhancing student achievement (Hallinger, 2018).

Challenges in Educational Monitoring and Supervision

Educational monitoring and supervision are critical, interconnected processes that form the backbone of an effective and high-quality education system. They extend beyond mere administrative oversight to become essential drivers of improvement, accountability, and student success. Their importance can be articulated through key areas.

1. **Enhancing Teaching and Learning Quality**: Effective supervision provides continuous, formative feedback to teachers, focusing on pedagogical strategies, classroom management, and curriculum implementation. This supportive, non-punitive approach fosters professional growth rather than simply enforcing compliance. A recent study underscores that instructional supervision significantly improves teachers' lesson preparation, teaching methods, and overall effectiveness in the classroom, which directly translates to improved student learning outcomes (Okyere & Atta, 2023).
2. **Ensuring Accountability and Standards Compliance**: Monitoring serves as a vital mechanism for accountability, ensuring that educational institutions adhere to national standards, policies, and curricula. It verifies that allocated resources are used appropriately and that schools are meeting their mandated objectives. This process helps identify inefficiencies, corruption, and gaps between policy and practice, thereby safeguarding public investment in education and maintaining a baseline of quality across the system (UNESCO, 2023).
3. **Facilitating Data-Informed Decision Making**: Modern educational monitoring systematically collects and analyzes data on a wide range

of indicators, from student achievement and attendance to teacher deployment and infrastructure. This empirical evidence is indispensable for effective planning and policy formulation. At all levels from the classroom teacher to national ministries data-driven insights enable stakeholders to make informed decisions, target interventions where they are most needed, and allocate resources more efficiently (World Bank, 2022).

4. **Promoting Professional Development for Educators**: Supervision is a cornerstone of continuous professional development. By identifying individual and collective teacher needs through classroom observations and assessments, supervisors can recommend or organize targeted training workshops, mentoring programs, and professional learning communities. This moves beyond one-off training sessions to create a culture of lifelong learning, ensuring that teaching practices evolve to meet new challenges and incorporate evidence-based methodologies.
5. **Improving Equity and Inclusive Education**: Robust monitoring systems are crucial for tracking disparities in educational access and outcomes. By disaggregating data by gender, location, socioeconomic status, and disability, authorities can identify marginalized groups who are being left behind. Supervision ensures that inclusive education policies are actually being implemented in classrooms, helping to bridge equity gaps and ensure every child has the opportunity to succeed (UNESCO, 2023).

Impacts of Poor Monitoring and Supervision

Effective monitoring and supervision are fundamental to organizational integrity, performance, and safety. Their deficiency can trigger a cascade of detrimental impacts, compromising both immediate operations and long-term sustainability.

1. **Erosion of Quality and Safety Standards:** The most immediate impact is the decline in the quality of outputs and adherence to safety protocols. Without diligent oversight, deviations from standard procedures become commonplace. In healthcare, for example, inadequate clinical supervision is directly correlated with a higher incidence of medical errors and adverse patient events, fundamentally compromising patient safety and care quality (Bennett & O'Donovan, 2021).

2. **Diminished Accountability and Ethical Lapses:** A lack of consistent oversight fosters an environment where accountability is weak and misconduct can thrive. Employees may perceive that their actions are not scrutinized, leading to negligence, data falsification, or more serious ethical breaches. This is particularly dangerous in financial and corporate settings, where poor supervision is a key enabler of fraudulent activities and significant compliance failures, exposing the organization to legal peril and reputational damage (Arena & Jeppesen, 2023).
3. **Stifled Employee Development and Low Morale:** Effective supervision is crucial for coaching, feedback, and professional growth. Its absence leads to disengagement, as employees feel unsupported and unclear about expectations. This results in stagnating skills, decreased productivity, and higher turnover rates. Research confirms that poor supervisory support is a primary driver of employee intention to leave, representing a significant loss of talent and institutional knowledge (Mengesha, 2022).
4. **Inefficient Resource Allocation and Financial Waste:** Projects lacking active monitoring are highly susceptible to scope creep, severe budget overruns, and missed deadlines. In public and development sectors, weak supervisory capacity is a leading cause of project failure and fiscal inefficiency. The World Bank consistently identifies inadequate supervision as a root cause for projects failing to deliver intended benefits, resulting in a massive misallocation of public funds and resources (World Bank, 2023).
5. **Strategic Misalignment and Impaired Decision-Making:** Supervisors act as a critical feedback loop, providing real-time data from frontline operations to leadership. Without this vital intelligence, executives make strategic decisions based on flawed or outdated information. This disconnection causes the organization's actions to drift from its strategic objectives, rendering it unable to adapt to challenges or seize new opportunities effectively.

Challenges supervisors face in managing resistance from teachers during classroom observations

Classroom observations are a cornerstone of instructional leadership and teacher development, yet supervisors frequently encounter significant

resistance from teachers, creating a complex management challenge. This resistance stems from deep-seated anxieties and systemic issues, which supervisors must navigate skillfully to foster growth rather than entrench opposition.

1. **Perceived Threat to Professional Autonomy and Judgment**: Teachers often view observations not as supportive mechanisms but as high-stakes evaluations that undermine their professional autonomy. This perception transforms the supervisor into an inspector rather than a coach, triggering defensiveness. As noted in a study on teacher perceptions, the evaluative nature of observations can create a climate of fear and distrust, making teachers reluctant to be vulnerable and open to feedback (Derrington & Campbell, 2018). Supervisors must balance accountability with empowerment, a difficult tightrope to walk.
2. **Anxiety and Emotional Vulnerability**: Inviting an observer into one's classroom is an inherently vulnerable act. Resistance is frequently a manifestation of anxiety about being judged on practices that are deeply personal. This emotional response can lead to teachers becoming argumentative or withdrawing entirely from the feedback process. Supervisors must possess high emotional intelligence to build the psychological safety necessary for productive post-observation conferences (Graham, 2023).
3. **Lack of Trust in the Supervisor's Expertise or Intent**: The efficacy of feedback is entirely dependent on the teacher's trust in the supervisor's pedagogical knowledge and benevolent intent. Resistance is pronounced when teachers believe the observer lacks relevant subject-specific expertise or is conducting a "gotcha" observation. Building this trust requires consistency, transparency, and demonstrated instructional leadership, which is difficult to establish and maintain (Woulfin & Rigby, 2017).
4. **Ineffective or Inconsistent Evaluation Frameworks**: Teachers may resist observations if they perceive the evaluation rubric as misaligned with their teaching context, overly subjective, or applied inconsistently. When the criteria for success seem ambiguous or unfair, feedback is dismissed as invalid. Supervisors are challenged with applying rigid frameworks flexibly and contextualizing feedback to ensure it is seen as legitimate and relevant (Steinberg & Donaldson, 2016).

5. **Historical and Cultural Baggage**: Often, resistance is not about the current observation but is a reaction to previous negative experiences with punitive evaluation systems. A school's history with observations creates a cultural baggage that supervisors inherit. Changing this entrenched culture from one of compliance to one of continuous learning requires persistent effort and a shift in the broader organizational narrative, a long-term challenge for any instructional leader (Kennedy, 2016).

Overcoming Challenges in Educational Monitoring and Supervision

Effective educational monitoring and supervision are pivotal for enhancing teaching quality and student outcomes, yet they often encounter significant implementation challenges. These include teacher resistance, perceived lack of fairness, and inconsistent application of frameworks. To address these issues, the following five evidence-based strategies and best practices can foster a more constructive and collaborative supervisory process.

1. **Foster a Culture of Trust and Collaborative Growth**: Building trust is foundational to reducing resistance and encouraging openness to feedback. Supervisors should position themselves as partners in professional growth rather than solely as evaluators. Graham (2023) emphasizes the importance of creating a "feedback-friendly culture" where teachers feel psychologically safe to reflect on and improve their practice. This involves consistent communication, empathy, and demonstrating genuine commitment to teacher development.
2. **Implement Differentiated Supervision Models**: A one-size-fits-all approach often fails to address the diverse needs of educators. Differentiated supervision acknowledges varying experience levels and professional goals by offering options such as peer coaching, self-directed inquiry, or collaborative action research alongside traditional observations. This strategy, supported by adult learning principles (Knowles et al., 2015), empowers teachers by giving them agency in their growth process, thereby reducing defensiveness and enhancing engagement.
3. **Ensure Transparency and Calibration**: To mitigate perceptions of bias or inconsistency, supervisors must use clear, research-based evaluation rubrics and engage in calibration exercises with other leaders. Steinberg and Donaldson (2016) note that reliability in

observational systems is critical for legitimacy. When teachers understand the criteria and see them applied uniformly, they are more likely to view feedback as valid and fair.

4. **Adopt a Coaching Stance in Feedback Conversations**: The post-observation conference should prioritize reflective dialogue over directive criticism. Supervisors can use facilitative questioning to encourage self-assessment, such as, "What were you hoping students would take away from this lesson?" Knight (2018) advocates for this coaching approach, which shifts the dynamic from judgment to collaborative problem-solving, making teachers active participants in their improvement.
5. **Leverage Technology for Authentic Assessment**: Digital tools can make monitoring more continuous and less intrusive. Video recordings, e-portfolios, and data platforms allow for self-reflection, peer feedback, and richer evidence collection. DeWitt (2020) suggests that technology can help decentralize supervision, reduce anxiety, and provide a more holistic view of teaching practice over time.

Sequel to earlier discussions, the study prescribed the following suggestions

1. Government and schools need dedicated, qualified experts in supervision. This requires appointing personnel with specialized training in education, administration and supervision and providing continuous professional development focused on pedagogical leadership and supportive mentoring, not just administrative control
2. To overcome resources and logistical barriers, education system can adopt technology for both onsite and electronic supervision. This includes using mobile application for data collection, virtual platforms for providing feedback and professional development and digital tools like CCTV for remote monitoring of administrative aspect.
3. It encouraging practice where principals and experienced teachers observe and support their colleagues to do the needful
4. Supervisor show act and supporting colleagues rather than critics to encourage open communication and genuine improvement
5. Monitoring and supervision should not be a meaningless formality. The information gathered through these process must be systematically analyzed and used to inform planning, resource allocation and policy adjustment at the school, local and national.

Conclusion

Effective educational monitoring and supervision are paramount for quality education, yet significant challenges persist. The primary obstacle is the sheer scale of the task, often leading to superficial, compliance-focused inspections rather than deep, formative engagement. This is compounded by a critical shortage of qualified personnel and resources, straining systems and limiting meaningful school visits. Furthermore, many supervisors lack adequate training in modern pedagogical practices, hindering their ability to provide constructive, relevant feedback to teachers.

Resistance from teaching staff, who may perceive supervision as a punitive rather than a supportive mechanism, creates a barrier to improvement. The over-reliance on quantitative data, such as test scores, often oversimplifies the complex reality of teaching and learning, neglecting crucial qualitative aspects like classroom climate and critical thinking. Finally, logistical issues, including remote school locations and inadequate funding, further impede consistent and effective oversight. Overcoming these hurdles requires a paradigm shift from inspection to mentorship. Investing in specialized training for supervisors, fostering a collaborative culture of professional growth, and developing holistic evaluation frameworks that balance data with qualitative insight are essential steps. Ultimately, effective monitoring must be reconceptualized as a supportive, continuous process aimed at empowering educators and enriching student learning outcomes.

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Assessing the Availability and the Level of Success of ICT Projects in Public University Libraries in Northwest Nigeria

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Abstract

The aim of the study was to assess the availability and level of success of Information and Communication Technology (ICT) projects in public university libraries in Northwest Nigeria, Two research questions were formulated to guide the study. Descriptive survey research design was employed for the study. The populations of the study are two hundred and ten (210). The entire sample chosen was one hundred and twenty-six (126) using purposive sampling technique. This comprises six Public Universities. The sample size from the population was considered adequate as it conforms in Krejcie and Morgan table for determining sample size. The questionnaire was used as instrument for data collection. The instrument was face validated by three experts one from Measurement and Evaluation unit and two experts from library department, Sokoto State University, Sokoto. Data collected was analyzed using Mean and Standard Deviation. Findings revealed that, ICT adoption and functionality of ICT project, ABU Zaria and BUK emerged as leaders by demonstrating advanced ICT facilities that were both available and functional. Conversely, JigSU and KSUSTA recorded low levels of ICT functionality. Findings also shows that ICT projects like automation, OPAC, CCTV and Open Educational Resources were rated successful, while others such as RFID, digital preservation and virtual meeting tools were rated less successful. The overall mean indicated a moderate level of success in ICT project implementation across the institutions. The study concludes that ICT infrastructure has improved service delivery in leading libraries, but significant gaps remain in others, and recommended urgent intervention to ensure equity and sustainability in ICT-driven library services.

Keywords*:* Assessment, ICT, Project, Public University, Libraries

Introduction

University libraries serve as vital hubs of knowledge, supporting the teaching, learning, and research missions of higher education institutions. Central to this role is the provision of access to vast collections of books, journals and various digital resources facilitated by deployment of advanced technologies. However, due to growing collections of print and digital information resources, and changes in user demands and preferences, application of Information and Communication Technology (ICT) has become a necessity in every library. Thus, several efforts have been made over the years to ensure transition and transformation of libraries in Nigeria from traditional to digital systems Saka et al., (2021) noted that through the application of ICT, some digital transformation efforts were made by university libraries in Nigeria, which include digitization, deployment of online public access catalogue, developing institutional repository, and online reference services.

In libraries like other sectors, ICT project has become a critical success factor for efficiency of operations, effective performance, and getting the expected outcomes towards attaining the set goals and objectives of parent institutions. Therefore, application of ICT in any library requires serious consideration and integration of project management processes. These processes as stated by Liana et al., (2023) are project initiation, planning, execution, monitoring, controlling, and closing. A careful consideration of these processes will help ensure the success of project delivery. However, the expected success can be achieved by ensuring effective project management.

In modern libraries, ICT project planning, implementation and sustenance has become one of the most essential successes factors for the overall technology integration. However, there is the general assumption that ICT project is just involved a set of activities requires only hardware, software, computer networking systems, and other operating and application packages that will ultimately bring some technological changes into an organization (Wu et al., 2018). Indeed, library ICT project projects require effective project management from its initial stage up to completion level, and followed by continuous monitoring and evaluation for sustenance. According to Liana et al., (2023) assert that many ICT projects in the public sectors of the developing countries fails partially or completely due to deficiencies in the planning and lack of proper understanding of expected outcomes and sustainability strategies.

Information and Communication Technology (ICT) encompasses a wide range of digital tools and resources used to generate, manage, store, and disseminate information effectively. In the context of university libraries, Amaka and Angela (2018) describe ICT as consisting of all forms of communication equipment and software employed to generate, store, transmit, interpret, and manipulate information across various formats. Recent advances in IT have not only increased tremendously the ability to access, store and process information within the library but also have brought significant changes in the concept, organisation, functioning and management of library and information systems (Kodytek et al., 2023). The IT revolution has facilitated the processes of searching for and recovering information; ICT improves the efficiency of organizational management processes and provides new ways of improving the capacity of response to its users (Alzahrani and Alfouzan 2022) The integration of ICT-based products and services emerges as the solution to these issues, enabling libraries to keep pace with the increasing information load and user expectations.

Effective practices for ICT project success, as outlined by Ifinedo (2018), include understanding the complexity of implementation, tailoring projects to specific needs, retraining staff for upcoming ICT changes, selecting appropriate and easily implementable technologies. The integration of ICT into Nigerian university libraries has profoundly transformed their operations and service delivery. Dawa (2022) observes that ICT has shifted the core functions of libraries from mere acquisition and storage of information to a focus on access, dissemination, and practical utilization. This technological revolution has also altered user expectations, positioning libraries as active centers for information dissemination rather than just repositories of books. Vijayalakshmi (2019) discussed that, one of the main objectives of ICT in library settings is to familiarize users with the functionalities of electronic media and digital tools, thereby enhancing their information literacy and operational understanding. Similarly, Srinivasa (2023) emphasizes that in the 21st century, the role of ICT in library operations is crucial; many manual routines have been automated, which results in faster and more efficient service delivery to users. The primary aim of integrating ICT is to improve information accessibility, elevate the quality of services, and support academic research and learning activities. However, the successful implementation of ICT projects hinges on critical factors such as adequate infrastructure and the presence of skilled personnel.

Furthermore, in the Nigerian context, ICT has substantially enhanced service delivery in many libraries. According to Essien et al. (2022), the adoption of ICT facilitates the digitization of storage, retrieval, and dissemination of academic resources, thus helping to modernize library functions. Overall, ICT's integration in libraries worldwide—and particularly in Nigeria has led to significant progress in providing efficient, accessible, and technology-driven services that meet evolving user needs. The prominence of ICT projects such as automation and digitization in Nigerian libraries reflects a strategic move towards modernizing information management and service delivery. The developments in digital technologies and specifically the paradigm shift in library services with the advent of Information and Communication Technologies (ICTs), internet services, electronic resources, digital collections and other digital technology services have led to advancement in digital literacy in academic libraries and among librarians (Atram Ku PN, 2017).The facilities supporting these ICT initiatives are diverse, encompassing computer workstations, internet access, offline resources, digital cameras, printers, scanners, DVDs, and CD-ROMs (Anthonia & Vincent, 2022).

Objectives of the Study

The aim of this study is to Assess the availability and level of success of ICT project in Public University Libraries in North West geopolitical zone, Nigeria. Specifically, the study is intended to:

1. Ascertain the availability of library ICT projects in public University Libraries in North-West Nigeria.
2. Determine the level of success of the implemented Library ICT projects among Public University Libraries in North-West Nigeria,

Methodology

Descriptive survey design was adopted for the study. The descriptive survey is appropriate and suitable as a guide to examine the opinion of the respondents on the subject under study. The population of the study is two hundred and ten (210). Purposive sampling technique or was used based on the characteristics of the population to sample one hundred and twenty-six (126) with the view of getting adequate information. The sample size from the population was considered adequate as it conforms in Krejcie and Morgan table that determined the sample size. Data was collected through the use of questionnaire as an instrument for data collection, were one hundred and

twenty-six (126) copies of questionnaire were filled, returned and analysed. The instrument was validated by three expert one from measurement and evaluation unit and two experts from the library department Sokoto State University, Sokoto. The data collected was analyzed using Mean and Standard deviation.

Results

Table 1: Status of ICT Projects in Selected University Libraries in Northwest Nigeria

S/N	Type of Library ICT Project	ABU Zaria	BUK Kano	Jigawa SU	UMYU Katsina	UDUS Sokoto	KSUSTA Aliero
1	Automation	AF	AF	ANF	AF	AF	ANF
2	Radio Frequency Identifier (RFID)	ANF	AF	NA	NA	ANF	NA
3	Digitization	AF	AF	A	AF	AF	A
4	CCTV	AF	AF	AF	AF	AF	AF
5	Open Educational Resources (OER)	AF	AF	A	AF	AF	A
6	Institutional Repository	AF	AF	NA	AF	AF	A
7	Online Public Access Catalogue (OPAC)	AF	AF	ANF	AF	AF	ANF
8	Online Reference & Information Service	AF	AF	NA	A	AF	A
9	Database Management & Access	AF	AF	A	AF	AF	A
10	Online Catalogues & Discovery	AF	AF	ANF	AF	AF	A
11	Communication & Outreach Tools	AF	AF	A	AF	AF	A
12	Digital Archiving	AF	AF	NA	A	AF	A
13	Digital Preservation Tools	AF	AF	A	AF	AF	A
14	Virtual Meeting Tools	AF	AF	A	AF	AF	ANF
15	Others (e.g.,	A	AF	NA	A	AF	NA

	Mobile Library Apps, LMS)

Note. AF = Available and Functional; ANF = Available but Not Functional; A = Available; NA = Not Available.

The data from Table 1 revealed six institutions under study are: Ahmadu Bello University (ABU) Zaria, Bayero University Kano (BUK), Sule Lamido University Jigawa, Umaru Musa Yar'adua University (UMYU) Katsina, Usmanu Danfodiyo University Sokoto (UDUS), and Kebbi State University of Science and Technology Aliero (KSUSTA) there is evidence of significant effort to integrate ICT in library operations, though the level of functionality differs.

At ABU Zaria and BUK Kano, ICT projects are the most advanced. Nearly all listed projects are both available and functional. From automation, digitization, CCTV, online public access catalogues, institutional repositories, to modern tools like virtual meeting platforms and digital preservation, these two universities demonstrate leadership in ICT adoption. Their libraries stand out as models where most ICT infrastructure is not only present but also actively functional.

In contrast, Jigawa State University (JigSU) and KSUSTA Aliero lag behind in ICT functionality. For instance, while automation, OPAC, and online catalogues are available, they are often not functional. Some projects such as RFID, institutional repositories, digital archiving, and virtual meeting tools are completely unavailable. This indicates structural and operational gaps that need addressing to bring them up to par with other institutions.

At UMYU Katsina, ICT availability is relatively strong, with many tools such as automation, digitization, CCTV, OPAC, institutional repository, and online catalogues being available and functional. However, gaps remain in advanced ICTs like RFID, digital archiving, and mobile library apps, which are either unavailable or limited in functionality. This suggests moderate progress but also points to areas that require greater investment.

UDUS Sokoto presents a fairly advanced ICT environment, comparable to ABU and BUK. Most ICT projects, including automation, digitization, CCTV, OPAC, digital preservation, and even emerging tools like mobile library apps, are available and functional. However, RFID technology appears to be a common challenge, being either not functional or absent in most universities, including UDUS.

Generally, the data indicates that while ABU Zaria, BUK Kano, and UDUS Sokoto are leading in ICT functionality, universities like JigSU and KSUSTA Aliero are significantly behind, with many ICT tools either non-functional or unavailable. UMYU sits in the middle, reflecting partial progress. A common weakness across almost all institutions is the limited adoption and functionality of RFID technology, which points to challenges in implementing more advanced security and resource management systems.

Table 2: Respondents on the Level of Success of ICT Projects in Public University Libraries in Northwest Nigeria

S/N	Statements	VHL	HE	VLE	LE	N	FX	$\bar{X}$	STD	Decision
1	Automation	38	47	28	13	126	341	2.71	1.02	Agreed
2	Radio Frequency Identifier (RFID)	20	30	40	36	126	298	2.37	0.96	Disagreed
3	Digitization	25	44	39	18	126	318	2.52	0.91	Disagreed
4	CCTV	32	49	28	17	126	335	2.66	1.01	Agreed
5	Open Educational Resources (OER)	40	41	30	15	126	341	2.71	1.05	Agreed
6	Institutional Repository	29	46	37	14	126	327	2.6	0.94	Agreed
7	Online Public Access Catalogue (OPAC)	41	48	25	12	126	349	2.77	1.1	Agreed
8	Online Reference & Information Service	36	45	31	14	126	335	2.66	1.08	Agreed
9	Database Management & Access	28	47	34	17	126	326	2.59	1.01	Agreed
10	Online Catalogues & Discovery	34	42	31	19	126	328	2.6	1.07	Agreed
11	Communication & Outreach Tools	30	46	33	17	126	326	2.59	1.03	Agreed

12	Digital Archiving	27	40	36	23	126	319	2.53	0.97	Disagreed
13	Digital Preservation Tools	24	39	41	22	126	315	2.5	0.92	Disagreed
14	Virtual Meeting Tools	22	38	43	23	126	311	2.47	0.95	Disagreed
15	Others (e.g., Mobile Library Apps, LMS)	18	22	20	10	70	196	2.8	1.12	Agreed
								2.61 (AWM)		

Note. Decision Rule: Mean ($\bar{X}$) ≥ 2.50 = Agreed; Mean ($\bar{X}$) < 2.50 = Disagreed. VHL = Very High Extent; HE = High Extent; VLE = Very Low Extent; LE = Low Extent.

The findings from Table 2 revealed a moderate level of success in the implementation of ICT projects in public university libraries in North-West Nigeria, with an overall average weighted mean (AWM) of 2.61. Projects such as OPAC, automation, OER, CCTV, and online reference services were rated successful, while advanced projects such as RFID, digitization, digital preservation tools, and virtual meeting tools were rated less successful.

The relatively high success of OPAC implementation indicates that most libraries in the region have successfully transitioned from manual cataloguing systems to online platforms. This development enhances resource visibility and accessibility, providing users with a more efficient way to retrieve bibliographic information. The success of OPAC reflects deliberate institutional efforts to modernize basic library operations and sets a foundation for the adoption of other ICT projects.

However, sustaining OPAC depends on consistent funding, regular system upgrades, and staff training. Its success demonstrates that with proper investment in infrastructure and human capacity, public university libraries in the region can effectively adopt ICT projects. Thus, OPAC serves as an example of an achievable and sustainable ICT intervention.

Radio Frequency Identification (RFID) was rated the least successful ICT project. Despite its global reputation for improving circulation efficiency and securing library resources, RFID adoption remains minimal in public university libraries in North-West Nigeria. Its low success may be due to high

costs of installation, inadequate technical know-how, and insufficient funding support from institutions.

The poor performance of RFID highlights the technological gap between Nigerian university libraries and global best practices. While RFID could revolutionize resource management and reduce theft, its failure to thrive demonstrates the limitations imposed by financial and infrastructural constraints. This finding suggests that until funding and technical expertise improve, advanced ICT projects will remain difficult to implement successfully.

Conclusion

The study concludes that ICT projects have become essential drivers of effective information service delivery in university libraries. ABU Zaria and BUK Kano stand out as benchmarks of ICT adoption in Northwest Nigeria, successfully implementing a broad range of ICT tools and resources. However, JigSU and KSUSTA face challenges of inadequate infrastructure, poor functionality, and limited project success, which hamper their ability to meet the modern information needs of users. While ICT projects have moderately succeeded in public university libraries in the region, there remains a digital divide among institutions that must be addressed to achieve uniform progress.

Recommendations

3. Strengthening ICT Infrastructure: Universities with low ICT adoption, particularly JigSU and KSUSTA, should prioritize investments in core ICT facilities such as automation, OPAC, institutional repositories, and digital archiving.
4. Government and Stakeholder Support: State governments, the Tertiary Education Trust Fund (TETFund), and development partners should provide targeted funding and policy support to bridge ICT gaps across universities.
5. Capacity Building and Training: Continuous training of librarians and ICT staff is necessary to ensure proper utilization and management of available ICT tools.

6. Sustainability and Maintenance: Institutions should establish maintenance frameworks to ensure that ICT projects remain functional beyond initial implementation.
7. Collaboration and Benchmarking: Less advanced institutions should collaborate with leading universities like ABU and BUK to adopt best practices in ICT-driven library services.
8. Inclusion of Emerging Technologies: Universities should plan for the gradual adoption of modern tools such as RFID, digital preservation systems, and virtual meeting platforms to enhance efficiency and global visibility.

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Application of Classical Test Theory Model on 2021 Mathematics Objectives Items of Entrance Examination into Senior Science and Technical Colleges in Kano State, Nigeria

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Abstract

The study applied classical test theory model on 2021 Mathematics objectives items of Entrance Examination in to Senior Sciences and Technical Colleges (EESSTC). The study has Four (4) objectives and Four (4) research questions. The study employed Descriptive survey design. The population of the study consisted a total number of fourteen thousand six hundred and fourty seven (14,647) examinees that sat for 2021 Mathematics EESSTC in Kano state. A sample of five hundred (500) were drawn using cluster proportionate to the size sampling technique The item analysis were carried out using Classical Test Theory (CTT) Frame work. The findings from the study revealed EESSTC 2021 Mathematics items 13(43.33%), 16(53.33%) and 1(3.33%) are difficult, moderate and easy items respectively with a mean of 0.34. The discriminating power showed that 9(30%), 9(30%), 8(27%) and 4(13%) are very good, good, acceptable and poor items respectively with a mean of 0.31. It was concluded that 2021 Mathematics items of EESSTC achieved acceptable psychometric indices. It was recommended that services of Tests and Measurement expert should be employed during items development process in order to improve their psychometric properties.

Keywords*:* Classical Test Theory, Entrance examinations, Senior Sciences and Technical Colleges, Mathematics, Objectives Items.

Introduction

The quality of any instrument is to measure effectively learning outcome from the students. Test items are the most important or basic blocks for building any good instrument for assessment. During items development process it is essential that the characteristics of the item be examined before the test administration. This can be done by applying one of the test quality estimate model which is the classical Test Theory Frame work.

Classical test theory (CTT) is a body of related psychometric theory that predicts outcome of psychological testing such as the difficulty of items or the ability of the test taker, is a theory about test scores that introduce three concepts. 1. Test Scores (often called Observed score) 2. True Score and 3. Error Score. It is assumes that observed score is equal to true score plus some error. Therefore the central model of this theory is that, observed score is composed of the true score and error score denoted as:

$$X=T\pm E.$$

Where X= Observed score, T= True score and E=Error score. Classical test theory is concerned with relationship between the three variables X. T. E. are used to say something about the quality of the test scores (Abdullahi,2016). The Observed score (X) is simply the score that a students earn and it is familiar to teachers and students. The True score (T) and Error score (E) are unobserved and are confusion to many layman. This is because they are hypothetical concept whose values one cannot know. The True score is usually thought to be the mean score that a person will get if he/she had taken the test for an infinite number of time. The error scores is the estimated error that occur in the measurement. Classical Test Theory is a framework that is used to determine the difficulty level and discrimination power ability of the test item. Item difficulty is a measure of the difficulty level of the items. It is obtained by finding the proportion of examinee that got the items correct. The discrimination index measure the ability of the test items in differentiating between the abilities of the examinee. It is obtained finding the difference in the proportion of high achieving and low achieving examinees, who scored the item correctly using. According to Babatunde (2019) Students' performance in an examination is determined by several factors among which is the factors associated with item characteristics of the examination. (Item difficulty, discrimination).

As investigated by the researcher Entrance Examination in to Senior Science and Technical Colleges which is conducted by Kano state government through Science and Technical schools Board (STSB) in order to screen out students for appropriate placement in to Senior Science and Technical Colleges resulted to low pass rate and it is of unknown psychometric properties as there is no evidence the items passed through standardization process of CTT frame work items analysis. The Examination covers sciences and Technical subjects offered at that level including English and Mathematics. Candidates must passed a minimum of an average of 40/45 marks before he/she is qualified to be place into Senior Sciences or Technical Colleges in Kano State.

Mathematics is very important in the academic life of a student's, a fundamental discipline for science and technological development. Mathematics was accorded high value and was made a compulsory subject in the school system as it opens mind to analytical thinking, logical reasoning and the aptitude for innovative ideas, deep focusing and clarity of thought and precision. This work was based on the Classical Test Theory of measurement, which assumes that each individual has a true score, which would be obtained if there are no errors in measurement.

Statement of the Problem

Kano State Government, through the Ministry of Education, conducts Entrance Examination into Senior Science and Technical Colleges. The examination is taken at the third level of junior secondary school for the purpose of placement of students in to Senior Science and Technical Colleges in the state.

However, statistics obtained by the researcher from Science and Technical Schools Board (STSB) showed that only 24%, 22%, and 28% of the students that sat for the examination for the year 2018, 2019 and 2020, respectively passed Mathematics. On investigation by the researcher, the psychometric properties of the examination is unknown as there is no evidence that showed the items of the examination pass through the standardization process of items analysis. This prompt the researcher to apply Classical Test Theory model on 2021 Mathematics objectives item of Entrance examination in to senior secondary school to determine their qualities.

Objectives of the Study

The objectives of the study are to find out:

1. the proportion of difficult, moderate and easy items of 2021 Mathematics items of EESSTC
2. the mean items difficulty index of 2021 Mathematics items of EESSTC
3. the proportion of very good, Good, acceptable and poor discriminating items of 2021
4. Mathematics items of EESSTC
5. the mean item discriminating power of 2021 Mathematics items of EESSTC

Research Questions

The objectives of the study were addressed by the following research questions

1. What is the proportion of difficult, moderate and easy items of 2021 Mathematics items for EESSTC?
2. What is the mean difficulty index of 2021 Mathematics items of EESSTC?
3. What is the proportion of very good, good, acceptable and poor discriminating items of 2021 Mathematics items of EESSTC?
4. What is the mean discriminating power of 2021 Mathematics items for EESSTC?

Methodology

The study employed descriptive survey design. The population of the study consisted of a total number of fourteen thousand six hundred and fourty seven (14,647) responses of the test takers that sat for 2021 Mathematics EESSTC in Kano state. A sample of five hundred (500) from the examination were drawn using cluster proportionate to the size sampling technique. Raw scores of 30 Mathematics objectives items constructed, administered and scored by Science and Technical Schools Board (STSB) were formally collected by the researcher. The data were then transform in to binary scores (0&1). Correct answer '1' and wrong answer '0' with aid of excel. The item difficulty and discrimination power ability indices were carried out using Classical Test

Theory (CTT) Frame work with aid of excel. The difficulty and discrimination indices were expressed using simple percentages. The mean difficulty and mean discrimination index were obtained using SPSS.

Results

Research Question 1: What is the proportion of difficult, moderate and easy items of 2021 Mathematics items of EESSTC

Table 1. Summary of the Difficulty levels of 2021 SSTCEE Mathematics items

Item Difficulty Range	Number of items (%)	Level of Difficulty
≤ 0.30	13 (43.33%)	Difficult
0.31≤70	16(53.33%)	Moderately difficult
> 0.70 Easy	1(3.33%)	Easy
Total	30(100)	

Source: (field survey, 2023)

The results of the difficulty levels for EESSTC 2021 Mathematics items showed that out of 30 items13(43.33%) are difficult, 16(53.33%) are Moderately difficult and 1(3.33%) is Easy items. This showed that 16(53.33%) of the 30 items are 'good' (moderate difficult) while14 items failed to satisfy the conditions (0.31≤70). However, more items were found at moderate acceptable level of difficulty.

Research Question 2: What is the mean items difficulty index of 2021 Mathematics items of EESSTC?

Table 2: Mean Items Difficult Index of 2021 EESSTC 2021 Mathematics items

Exam Type	NO. of items	Mean	Std	Std Error Mean
SSTCEE	30	0.34	.16534	.03019

Source: (field survey, 2023)

The mean difficulty index for EESSTC is 0.34, standard deviation .16534 and standard error mean .03019. This signifies the test items achieved moderate difficult level (0.31≤70).

Research Question 3 What is the proportion of very good, good, acceptable and poor discrimination items of 2021 Mathematics items of EESSTC

Table 3: Summary of the discrimination levels of 2021 EESSTC Mathematics items

Item Discrimination Range	Number of items (%)	Level of Discrimination

0.40 and above	9(30%)	Very Good items
0.30 to 0.39	9(30%)	Good items
0.20 to 0.29	8(27%)	Acceptable items
-1.00 to 0.19	4(13%)	Poor items to be revised eliminated completely
Total	30(100)	

Source: (field survey, 2023)

Based on the discriminating power index criteria set by Bichi (2015) EESSTC 2021 Mathematics items indicated that, 9(30%) of the 30 items have very good discriminating power, 9(30%) are Good 8(27%) are acceptable and 4(13%) are poor items.

Research Question 4: What is the mean discriminating power of 2021 Mathematics items for BECE?

Table 4: Mean items discriminating power of 2021 EESSTC Mathematics items

Exam Type	NO. of items	Mean	Std	Std Error Mean
SSTCEE	30	0.32	.12467	.02276

Source: (field survey, 2023)

From the table4, the mean discriminating power index of 2021 Mathematics items for EESSTC is 0.32, standard deviation.12467, standard error mean .02276.This signifies that the test items are good ($\geq$20).

Summary of findings

1. Out of 30 items of EESSTC 2021 Mathematics items 13(43.33%) are difficult, 16(53.33%) are moderately difficult and 1(3.33%) is Easy items.
2. The mean difficulty index of 2021 Mathematics items for EESSTC is 0.34 which signifies that the test items achieved moderate difficult level.
3. EESSTC 2021 Mathematics items indicated that 9(30%) of the 30 items have very good discriminating power, 9(30%) are Good 8(27%) are acceptable and 4(13%) are poor items
4. The mean item discriminating power of 2021 Mathematics items for EESSTC is 0.32 which signifies that the test items are good.

Discussion

The findings on the difficulty level showed that out of the 30 items for 2021 EESSTC ,13(43.33%) are difficult, 16(53.33%) are moderately difficult and 1(3.33%) is Easy items as shown by table 1. This signifies that 16(53.33%) of the items achieve acceptable difficulty level (moderate difficult 0.31≤70). This result agree with submissions of John et al. (2020), Juliate (2018),Ado, and Sa'ad (2020), Bichi (2015), Anigbo (2015) and Ugodulunwa and Barko (2015), Moyinoluwa (2015).

The result of the mean difficulty index of 2021 Mathematics items of EESSTC in Table 2 showed 0.34 which signifies that averagely the test items are difficult. This finding disagree with submission of Deborah et al,(2021). When the purpose of the test is to discriminate among those who take the test, it should have average item difficulty of approximately 0.50. (Abdullahi,2016). The result of this study contradicted with this statement. Since the purpose EESSTC is to measure the achievement of students and discriminate between those who take it for proper placement into Senior Secondary Schools, the items on the test should be in agreement with this submission.

Based on the discriminating power criteria, the findings of this study showed that 9(30%) of the 30 items have very good discrimination, 9(30%) are Good 8(27%) are acceptable and 4(13%) are poor items for EESSTC 2021 Mathematics items as shown by table 3. This signifies that 26(87%) of the items satisfied the condition (≥20) while, 4(13%) items failed to satisfy the condition. The finding agree with findings of John et al. (2020), Juliate (2018), Ado, and Sa'ad (2020), Bichi (2015), Anigbo (2015), Ugodulunwa and Barko (2015), Moyinoluwa (2015), Orluwene et al.(2017).The mean discriminating power of EESSTC 2021 Mathematics items in table 4 showed a value 0.32. This result agree with Deborah et al.(2021)

Conclusion

The study applied classical test theory model on 2021 Mathematics objectives items of Entrance Examination in to Senior Science and Technical Colleges in Kano State Nigeria. It was concluded that the items of the examination achieved acceptable difficulty levels and discriminating power abilities. The poor pass rate recorded in this examination is not attributed to the items characteristics(difficulty and discrimination power ability) other factors

associated with measuring instrument such as validity and reliability of the 2021 Mathematics examination need to be investigated.

Recommendations

1. Items that satisfied the criteria for both difficulty and discrimination index should be retained for future use by the items developers of EESSTC. Those items that failed to satisfy the condition of items selection should be revised. It is more economical to revise the items than eliminating them completely.
2. Services of tests and measurement expert should be employed by Science and Technical Schools Board (STSB) during items development process in order to improve the psychometric properties Mathematics items for the incoming years,

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Impact of Street Hawking on Retention and Academic Performance of Junior Secondary School Students in Sokoto Metropolis, Implication for Counselling

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Abstract

The study examine the impact of street hawking on retention and academic performance of junior secondary school students in Sokoto metropolis, implication to Counselling. Two (2) research objectives and (2) hypotheses set for study. The study used quantitative approach, specifically utilizing a survey research design. The population of the study consisted of 2,900 Students of JSS 3 students. Purposive sampling technique was used to select 387 respondents. The instrument used for this study is questionnaire which was titled "Impact of Street Hawking on Retention and Academic Performance Questionnaire" (ESHRAPQ). The instruments were pilot tested and validated by experts in the field of education. The data collected were subjected to descriptive and inferential statistics. The results of first hypothesis indicated a significant difference in the retention rates between males and female students of junior secondary school students based on gender, the analysis showed that male students (M=72.15, SD=8.12) and female students (M=70.02, SD=7.85) with a mean difference of 2.13. The result of the second hypothesis indicate street hawking has no significant difference on the effect of academic performance of junior secondary students based on gender, the analysis showed male students (M=68.45, SD=7.82) and female students (M=65.90, SD=8.15) with a mean difference of 2.55 points The study concluded that; street hawking significantly affects junior secondary school students in Sokoto Metropolis, with clear variations based on gender. Finally, the researcher recommended that; Schools should introduce remedial classes, after-school tutoring, and flexible learning schedules to help street-hawking students, especially the most affected gender, recover academically and improve performance, education authorities should design and implement targeted retention strategies that address the unique challenges faced by male and female students affected by street hawking, ensuring both genders remain in school

Keywords*:* Street hawking, Retention, Academic performance and Counselling

Introduction

Academic performance is a critical indicator of educational success and a vital determinant of future opportunities for students. Globally, various factors influence students' academic outcomes, including socio-economic status, parental involvement, school environment, and individual motivation. In many developed countries, educational policies and resources aim to mitigate barriers to learning, fostering environments conducive to high academic achievement. However, in developing regions, particularly in Africa, the landscape is often characterized by challenges that significantly hinder academic performance (Sengonul, 2022).

In Africa, the educational system faces numerous flat race, ranging from inadequate infrastructure and limited resources to socio-cultural barriers. Ugo, U. S. (2024) highlights that many students encounter financial difficulties that compel them to engage in various forms of labor, including street hawking, to support their families. Street hawking, defined as the informal sale of goods in public spaces, has become a prevalent phenomenon in numerous African countries. The need to hawk goods often means spending significant time outside the classroom, which detracts from their study time and academic engagement. The struggle to balance hawk and education can lead to fatigue and stress, further impacting their academic outcomes (Ogunyemi, 2019). Research indicates that this practice not only reduces from students' time and energy dedicated to their studies but also affects their overall well-being. For instance, Raji, Muhammad, Dinebari, Bello, Oladigbolu and Kaoje (2017) and Ogungweru(2023) highlight that street hawking is associated with increased risks of physical and emotional harm, which can detrimentally affect a child's educational engagement and performance.

In Nigeria, the situation mirrors the broader African context. The country's educational system hand-to-hand struggle with issues such as overcrowded classrooms, insufficient teaching materials, and high rates of poverty. These factors create an environment where many students are compelled to supplement their family income through street hawking. According to UNICEF (2022), approximately 17 million children under the age of 14 are engaged in various forms of labor across Nigeria, with a significant portion involved in street hawking. This practice significantly impacts their retention in school and academic performance, often leading to lower grades, higher dropout rates, and diminished educational aspirations. High academic performance can lead to improved career prospects, higher income levels, and

a greater sense of personal fulfillment. Conversely, low academic performance can limit opportunities and hinder personal growth (Ojetayo & Adeniyi, 2024).

Sokoto, a state in the northwestern region of Nigeria, exemplifies these challenges. Sokoto state faces significant economic challenges, including a high poverty rate and limited economic opportunities (World Bank, 2020). Here, the socio-economic conditions are particularly pressing, with many families struggling to meet basic needs. The prevalence of poverty in Sokoto has been linked to high rates of street hawking, which is often viewed as a necessary means of survival for many families (Raji, Muhammad, Dinebari, Bello, Oladigbolu and Kaoje, (2017). Consequently, junior secondary school students may find themselves participating in street hawking as a means of survival. As a result, junior secondary school students often find themselves compelled to engage in street hawking as a means of generating income to support themselves or their families (World Bank, 2020). Street hawking has become prevalent among junior secondary school students in Sokoto State due to socio-economic factors such as poverty and limited access to quality education (Tsagem, &Idris, 2025). The implications of this practice are profound, as it not only disrupts their academic engagement but also alters their perceptions of education and its value.

Moreover, the cultural context in Sokoto plays a significant role in shaping students' attitudes toward education and street hawking. In many cases, educational attainment is undervalued, particularly for marginalized groups. This perception further worsens the challenges faced by students engaged in street hawking, as they may prioritize immediate financial support over long-term educational goals (Ogungweru, 2023). Additionally, the lack of strong support systems, both at home and in schools, can lead to a cycle of poverty and underachievement. Consequently, engaging in street hawking poses specific challenges that can impede academic performance. Firstly, the need to contribute to family income can divert the time and energy of these students away from their studies (Angela & Ovye, 2024). This diversion can result in reduced study time, lack of focus, and diminished academic performance. Secondly, street hawking often lacks the supervision and counseling necessary for students to develop discipline and motivation for academic pursuits (Ojetayo&Adeniyi, 2024). Without proper counseling, students may struggle to balance their academic responsibilities with their economic needs, leading to lower academic performance and retention.

Street hawking According to Nwajiuba and Oni (2017) Street hawking is a multifaceted phenomenon characterized by the sale of goods or services on the streets, sidewalks, or other public spaces by individuals, often children or adolescents, as a means of economic survival or income generation. Similarly, Ijadunola, Babatunde, Olatunji, Owolabi, Adewale, Ifedayo, I. F. & Friday (2015) conceptualizes street hawking as a form of informal economic activity characterized by the sale of goods or services in public spaces, often without proper licenses or permits. supported by Nasirudeen (2023) street hawking is viewed as a coping strategy adopted by marginalized individuals, particularly youth, who face limited access to education and employment opportunities. This was supported by Oyewale (2018) who asserted that Street hawking is conceptualized as a survival strategy that can simultaneously provide a sense of autonomy and dignity, while also exposing individuals to risks and vulnerabilities. The constant exposure to harsh living conditions, exploitation, and social stigmatization can have negative psychological consequences, leading to feelings of inferiority, hopelessness, and a diminished sense of self-worth (Atomatofa, 2020).

Retention in junior secondary education is a significant concern, particularly in Sokoto, where dropout rates exceed the national average due to students leaving school for full-time work or facing academic difficulties exacerbated by their hawking activities (Umar, 2020). This lack of educational retention not only hampers students' future career prospects but also contributes to broader societal issues, such as persistent poverty and underemployment. The psychological stress of balancing street hawking with academic responsibilities leads many students to experience anxiety, low self-esteem, and decreased motivation (Adeleke, 2022). Furthermore, the stigma of street hawking can isolate these students from their peers. Counseling can be crucial in addressing these challenges, as school counselors can provide support, coping strategies, and discussions on the importance of education, helping students navigate their dual roles and prioritize their studies despite external pressures (Okeke & Eze, 2023).

Therefore, the impact of street hawking on the retention and academic performance of secondary school students in Sokoto Metropolis is a critical issue that requires urgent attention. The socio-economic challenges faced by these students adversely affect their educational success and psychological well-being. By understanding these interconnected issues, counselors can

develop effective strategies to help students navigate their complex circumstances. Targeted counseling interventions can improve academic outcomes and retention rates, thereby offering a brighter future for the youth in Sokoto. This intersection of street hawking and academic performance is vital for research, as it can lead to more effective educational strategies and support systems tailored to student needs. The findings could also guide local educational policies and community initiatives aimed at curbing street hawking while promoting academic success. Engaging stakeholders such as government officials, educators, families, and community leaders is crucial for fostering an environment that supports educational attainment and safeguards children's rights in Sokoto.

Social Learning Theory (Bandura, 1977) is particularly pertinent to this study as it elucidates how street hawking behaviors may be acquired and perpetuated among secondary school students. When students observe peers or family members engaging in hawking, they may come to view it as a viable means of income. This perception can significantly influence their decision-making, leading them to participate in similar activities. The modeling of such behaviors can detrimentally impact their educational experience, as those who prioritize street hawking may emulate these observed actions, potentially devaluing their academic pursuits and affecting both retention rates and academic performance (Eke Ada, 2016).

Theory of Humanistic psychology (Carl Rogers,1951) is particularly relevant to the objective of exploring the necessity for counseling services for secondary school students engaged in street hawking in Sokoto Metropolis. Students involved in street hawking often face numerous psychological and emotional challenges, including stress, low self-esteem, and feelings of isolation. Counseling services grounded in humanistic principles can provide a supportive environment that fosters self-exploration and personal growth. By addressing the emotional and psychological needs of these students, counseling can help them develop coping strategies, enhance their self-worth, and improve their overall well-being.

Anyaogu (2022), examined child street hawking and the educational component of the Sustainable Development Goals (SDGs) in Aba Urban, Abia State, Nigeria. The study employs a cross-sectional survey design to gather data. The population of the study is stated as 498,260 adults aged 18 years and above. The researcher used a proportionate sampling technique to select a

sample size of 1,108 participants. Questionnaires and in-depth interviews (IDIs) were used as instruments for data collection. Data collected from the questionnaires were analyzed using the Statistical Package for Social Sciences (SPSS). The study's findings indicate that poverty is the major factor contributing to child street hawking. It highlights that poverty poses a significant challenge to achieving the educational component of the SDGs in many African states, particularly Nigeria. The study employs a proportionate sampling technique to select a sample size of 1,108 participants from a population of 498,260. However, the specific details of the sampling process, including how the proportions were determined, are not provided. Without this information, it is challenging to assess the representativeness of the sample and the generalizability of the findings.

Senna, (2023) conducted a study to investigate the impact of street hawking on the education of young female hawkers in Ghana's Volta region. The research employed non-experimental and descriptive methodologies, utilizing selective sampling to select 60 participants from a population of 17,335 adolescent schoolgirls involved in street hawking along the main roadway. Primary and secondary sources of information were utilized in the study. Both qualitative and quantitative data were collected for analysis. Qualitative data included the researcher's firsthand observations during fieldwork, while quantitative data were obtained through the use of questionnaires. The Statistical Package for the Social Sciences (SPSS) software was employed to analyze the quantitative data obtained from the questionnaires. The analysis involved descriptive techniques such as bar charts, graphs, and other relevant data analysis methods. The findings of the study revealed that a significant number of female street hawkers face challenges in regularly attending school due to their involvement in hawking activities on the streets. This lack of regular school attendance negatively impacts their academic performance, often resulting in poor educational outcomes. Additionally, a considerable proportion of these young female hawkers eventually end up dropping out of school. The study used selective sampling to choose 60 respondents from a population of 17,335 adolescent schoolgirls involved in street hawking. While the study acknowledges the sampling method, it does not provide information on how the sample was selected or whether it was representative of the larger population. This lack of transparency raises concerns about the generalizability of the findings to the broader population of young female hawkers in the Volta region.

Adebisi (2021) examined the implication of street hawking and its causal factors among youths in Sango-Ojoo axis of Ibadan. The study was a descriptive survey among 37 youths who were randomly sampled at potential hawking terminals. Data was collected through the use of multiple-choice questionnaires, and interview guide, while chi-square test was used in data analysis. Findings revealed a preponderance of female youth hawkers and poor education was the major causal factor of hawking amongst the youths. The study focuses specifically on the Sango-Ojoo axis of Ibadan and its implications for street hawking among youths. It is essential to recognize that the findings may not be directly applicable or generalizable to other contexts or locations. The study could have discussed the potential limitations and transferability of the findings.

Ibrahim, Magdalene and Abasido, (2021) examined street hawking as predictor of enrolment, attendance and retention of students in basic education in Gusau, Zamfara state. Survey design was adopted for the study. The researchers sampled 398 out of 40,715 Basic Education students for the study. Structured questionnaire titled Hawking and Enrolment (HSBE) was used for the data collection. The data collected were analyzed using mean scores to answer the research questions while logistic regression was employed in the test the null hypotheses at the significant level of $p \leq 0.05$. The study revealed that street hawking has significant influence on enrolment, attendance and retention of basic education students in Zamfara state.

Mohammed, Uniga, Bodi, & Mary-Marvella, (2022) investigated the effects of street hawking on children in Nigeria in the context of deprivation of access to and acquisition of quality education. The methodology used in the study is the survey method design, where a structured set of 120 questionnaires were distributed to collect primary data. Simple percentage and frequency were used to analyzed the collected data. The findings of the study reveal that the informal sector, despite not being regulated, provides jobs to millions of young people in Nigeria. The study identifies some of the causes of street hawking are poverty, illiteracy, and broken families.

Statement of the Problem

The phenomenon of street hawking among secondary school students in Sokoto Metropolis is a multifaceted issue that poses significant challenges to educational retention and academic performance. As economic pressures mount in Nigeria, particularly in regions with high poverty rates like Sokoto,

many students find themselves compelled to engage in street trading as a means of financial contribution to their households (National Bureau of Statistics, 2020). This engagement in street hawking can severely disrupt their academic pursuits, leading to a decline in educational outcomes.

The educational landscape in Nigeria is tense with challenges, including inadequate infrastructure, insufficient funding, and a lack of qualified teachers, which already hinder student performance (Umar, 2020). When compounded by the additional burden of street hawking, these challenges create a precarious situation for students. Research indicates that students who work while attending school often experience lower academic achievement and increased dropout rates compared to their peers who focus solely on their studies (Mokogwu & Nwankwo, 2021).

In Sokoto Metropolis, the socio-economic environment worsens these issues. Many families rely on the income generated by their children's hawking activities, creating a cycle where economic necessity prevails the importance of education. This dynamic can lead to students prioritizing their street activities over their schooling, ultimately affecting their engagement, motivation, and overall academic performance and retention (Ogunyemi, 2019). Moreover, the physical and emotional toll of balancing work and education can lead to increased stress, anxiety, and lower self-esteem among students (Adeleke, 2022).

Objective of the study

The study was guided by the following objectives

i. To examine the effect of street hawking on the retention rates of junior secondary school students based on gender in Sokoto Metropolis.

ii. To identify the effect of street hawking on the academic performance of junior secondary school students based on gender in Sokoto Metropolis.

Research Hypotheses

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

H_{01}: There is no significant difference in the retention rates of junior secondary school

Students involved in street hawking based on gender in Sokoto metropolis

H_{02}: There is no significant effect in the academic performance of junior secondary school students involved in street hawking based on gender in Sokoto Metropolis.

Methodology

This study employed a quantitative approach, specifically utilizing a survey research design, to investigate the effect of street hawking on the retention and academic performance of secondary school students in Sokoto metropolis. The population of this study consists of all the JSS3 students of six selected secondary schools in Sokoto metropolis. The population of this study comprises a total of 2,900 JSS3 students. This sub-population was considered appropriate and manageable for sampling and represented the study area adequately. One instrument was used for data collection.

The instrument for this study is an adapted Questionnaire tittle Impact of street Hawking on Retention and Academic Performance Questionnaire (ESHRAPQ). The instrument was validated while the reliability was confirmed using Cronbash's Alpha, yelding values above 0.80, which indicated high internal consistency. Data were collected with the assistance of trained aides and analyzed using descriptive and inferential statistics to answer the research questions while t-test was used to test the hypotheses.

Proportion of the Respondents in Each School

The study sample of 2900 junior secondary school students was drawn proportionate from six selected secondary schools with in Sokoto metropolis to ensure adequate representation

Table 1: Distribution of the population According to their Secondary Schools

S/N	School Name	Location	Population
1	Government Girls Day Secondary School (GGDSS) Badon Barade	Wammako Local Government	89
2	Government Day Secondary School (GDSS) BadonBarade, Sokoto	Wammako Local Government	47
3	Government Girls Day Arabic Secondary School (GGDASS) YarAkija, Sokoto	Sokoto South Local Government,	499

4	Giginya Memorial Secondary School, Sokoto	Sokoto South Local Government,	556
5	Government Day Secondary School KofarRini	Sokoto North Local Government	697
6	Government Girls Day Arabic Secondary School (GGDASS) Sabon Birni, Sokoto	Sokoto North Local Government	1012
	Total =		2,900 Students

Source: Education Resource Center (2023)

This distribution ensured that each school was fairly represented in the study sample, thereby increasing the validity and generalization of the finding within Sokoto metropolis

Result

The results shows demographic data of respondents, 245 respondents representing 63% were male while 142 respondents representing 37% were female. As regards age of respondents, 69 respondents representing 18% were 13-14years, 90 respondents representing 23% were 15-16years while 228 respondents representing 59% were 17years or older. In respect of grade level, 33 respondents representing 9% were JSS 1, 45 respondents representing 12% were JSS 2, 217 respondents representing 56% were JSS 3, 86 respondents representing 22% were SSS 1 while 6 respondents representing 2% were SSS 2. As regards frequency of street hawking, 34 respondents representing 9% never hawk, 39 respondents representing 10% hardly hawk, 214 respondents representing 55% sometimes hawk while 100 respondents representing 26% hawk often.

Hypotheses Testing

H_{01}: There is no significant difference in the retention rates of junior secondary school students involved in street hawking based on gender in Sokoto Metropolis.

Table 2: t-test analysis result comparing the difference in the retention rates of junior secondary school students based on gender due to street hawking in Sokoto Metropolis.

Group	N	Mean	Std. Deviation	t	Df	Sig. (2-tailed)	Mean Difference
Male	241	72.15	1.120	2.617	385	0.009	2.13
Female	146	70.02	1.240				

Source: Field Work, 2025

$$\propto = 0.05$$

Table 2 showed t-test analysis result comparing the difference in the retention rates of junior secondary school students involved in street hawking based on gender in Sokoto Metropolis. The analysis showed that male students (M = 72.15, SD = 8.12) had slightly higher retention rates than female students (M = 70.02, SD = 7.85), with a mean difference of 2.13. This difference was found to be statistically significant, t(385) = 2.617, p = 0.009, and the 95% confidence interval ranged from 0.53 to 3.73. Since the p-value is less than the 0.05 significance level, we reject the null hypothesis (H_{01}) and conclude that there is a statistically significant difference in the retention rates of junior secondary school students involved in street hawking based on gender in Sokoto Metropolis. This finding suggests that gender may influence how street hawking impacts students' ability to remain in school, possibly due to differences in household responsibilities, cultural expectations, or exposure to street hawking activities.

H_{02}: There is no significant effect on the academic performance of junior secondary school students involved in street hawking based on gender in Sokoto Metropolis.

Table 3: t-test analysis result showing the effect of street hawking on the academic performance of junior secondary school students based on gender in Sokoto Metropolis.

Group	N	Mean	Std. Deviation	t	Df	Sig. (2-tailed)	Mean Difference
Male	202	68.45	7.82	3.214	385	0.001	2.55
Female	185	65.90	8.15				

Source: Field Work, 2025

$$\propto = 0.05$$

Table 3 showed t-test analysis on the effect of street hawking on the academic performance of junior secondary school students based on gender in Sokoto Metropolis. The results showed that male students (M = 68.45, SD = 7.82) had significantly higher academic performance scores compared to female students (M = 65.90, SD = 8.15), t(385) = 3.214, p = 0.001. The mean difference was 2.55 points, with a 95% confidence interval from 1.01 to 4.09. Since the p-value is less than 0.05, we reject the null hypothesis (H_{O_2}) and conclude that street hawking significantly affects the academic performance of Junior Secondary School students based on gender. This suggests that the

academic consequences of street hawking may be more severe for one gender, potentially due to differences in time allocation, responsibilities, and exposure to hawking activities.

Summary of findings

1. There is significant difference in the retention rates of junior secondary school students based on gender due to street hawking in Sokoto Metropolis.
2. There is significant effect on the academic performance of junior secondary school students based on gender in Sokoto Metropolis.

Discussion of Finding

The findings from research question one and null hypothesis one (H_{01}) revealed a statistically significant difference in the retention rates of junior secondary school students based on gender due to street hawking in Sokoto Metropolis. This outcome indicates that male and female students experience different levels of school retention, potentially linked to the varying socio-economic roles and responsibilities assigned to them within their households. Male students may be more frequently engaged in hawking activities that conflict with school attendance, while female students may face additional domestic responsibilities coupled with hawking, both of which influence their ability to remain consistently enrolled. This aligns with the notion that socio-cultural expectations, economic pressure, and gendered division of labor contribute to differences in students' educational continuity. This finding is consistent with the observations of Akpotor (2018) who argued that street hawking exacerbates educational inequality by disproportionately affecting students' retention rates, especially when gendered socio-economic roles are considered. Their study highlighted that male students often leave school earlier due to perceived opportunities in income-generating activities, while females are withdrawn due to cultural beliefs about their roles at home. Similarly, Anyaogu (2022) stressed that gender dynamics in street hawking stem from structural inequalities in households, with children's educational futures shaped by who is deemed most capable of contributing financially. The present study's results corroborate these positions, underscoring the role of gender as a determinant of school retention patterns among students engaged in hawking.

The analysis of research question two and null hypothesis two ($H0_2$) revealed a significant effect of street hawking on the academic performance of junior secondary school students in Sokoto Metropolis, with variations observed based on gender. This finding indicates that while street hawking negatively impacts students' learning outcomes overall, the degree of its effect differs between male and female students. In many cases, male students may be engaged in physically demanding hawking activities that consume after-school hours, leading to fatigue and reduced time for homework or revision. Female students, on the other hand, often face the compounded challenge of combining hawking duties with domestic chores, which may further reduce the quality of their study time. These differentiated experiences suggest that gender-specific socio-economic roles interact with the demands of street hawking to produce varied academic outcomes. This findings aligns with submission of Senna, (2023), that child labor activities, including street hawking, impose a time and energy burden that diminishes children's academic performance, with gender influencing the nature and extent of the impact. They noted that while boys are often engaged in longer hours of labor outside the home, girls typically experience multiple role conflicts between economic activities and domestic obligations, amplifying the effect on their schooling. The findings is also supported by the ideas of Okeke (2014) that in socio-economically disadvantaged communities, street hawking reduced study hours, increased absenteeism, and caused lower academic scores, with female students bearing a heavier cognitive and emotional toll due to cultural expectations of home-based labor. The findings in Sokoto Metropolis align with these scholarly perspectives, emphasizing that interventions must address not only the practice of street hawking itself but also its gender-specific implications. The implication of these findings for policy and educational practice is that strategies to improve academic performance among students affected by street hawking must incorporate a gender-sensitive approach. Interventions could include conditional cash transfer programs to reduce families' dependence on children's economic contributions, provision of after-school academic support to mitigate lost learning time, and community awareness campaigns aimed at shifting socio-cultural expectations that place a heavier workload on female students.

Implication to Counselling

Counselling services in schools delivered by professional counselor to support students in various areas, including academic, career, social, emotional, and

personal development. When these services are implemented effectively, they help students to gain, self-awareness, identify their potential and feel empowered to tackle the challenges they face daily.

Conclusions

In conclusion, the results of this study demonstrate that street hawking significantly affects junior secondary school students in Sokoto Metropolis, with clear variations based on gender. The difference in retention rates between male and female students indicates that one gender is more adversely impacted in terms of staying in school, which may be linked to socio-cultural expectations and household economic demands. Likewise, the significant effect on academic performance reveals that street hawking reduces students' study time, concentration, and overall ability to achieve academic success, with one gender experiencing a greater negative impact. These findings point to the complex relationship between economic survival strategies, cultural norms, and educational outcomes, highlighting the urgent need to address street hawking as a major barrier to equitable learning opportunities.

Recommendations

1. Education authorities should design and implement targeted retention strategies that address the unique challenges faced by male and female students affected by street hawking, ensuring both genders remain in school.
2. Schools should introduce remedial classes, after-school tutoring, and flexible learning schedules to help street-hawking students, especially the most affected gender, recover academically and improve performance.
3. Government and community leaders should collaborate to provide poverty alleviation initiatives, such as conditional cash transfers, skill acquisition programs for parents, and access to microcredit, to reduce the economic need for children to hawk.
4. School counselors should develop and deliver targeted counseling interventions that cater to the distinct emotional, academic, and social needs of male and female students involved in street hawking.
5. Public enlightenment campaigns should be organized to educate parents and guardians on the negative effects of street hawking on

children's education and to promote the value of sustained school attendance for both boys and girls.

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