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Editorial

This edition of NIU *Journal of Educational Research* touches on Career Choice, Sustainable Educational Development, Artificial Intelligence Educational Tools and the Role of Information and Communication Technology (ICT) in Teachers Education for Sustainable Development in Nigeria.

One of the papers, in this issue, argues that the ICT environment in Nigeria needs to be enriched to ensure the training and development of teachers that are able to blend with the changing demands of teaching in the present era of globalisation with its emphasis on Information Communication Technology (ICT). The paper, therefore, recommends enhancement of teacher access and competence through curriculum adaptation that will involve theoretical and practical exposures in Information Communication Technology (ICT) as part of teacher education programme and provision of access to computer and other ICT infrastructure to teachers on the field.

Another paper also reveals that Artificial Intelligence (AI) tools has insignificantly contributed to sustainable entrepreneurship in clothing and textiles. The paper therefore, recommends that students need to be properly trained and equipped in handling these tools by teachers to be prepared for the job market.

On the whole, this issue of *NIU Journal of Educational Research* features many empirical and theoretical based articles which can be of great benefit to every reader.

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Factors Influencing the Career Choice of Undergraduate Science Education Students: Implication for Curriculum Studies and Lifelong Learning

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Abstract. This study investigated the factors influencing the career choice of undergraduate science education students and draws its implication for curriculum studies. The study was a survey research. The population of the study entails all 100 level undergraduate Science Education Students of the 2024/2025 academic session of the University of Benin, Benin City. A total of one- hundred and ninety-three (193) students cleared into the department of Curriculum and Instructional Technology, formed the sample of the study. The instrument for data collection was a likert scale questionnaire tagged "Career Choice Determining Factors" (CCDF) questionnaire. CCDF was validated by three lecturers from the Faculty of Education, University of Benin. The reliability of the instrument was established using Cronbach Alpha statistics. A reliability of 0.76 was obtained. This instrument was use for data collection. Items in CCDF were scored and analyzed using descriptive statistics of frequency, simple percentage and mean. Findings from this study revealed that Undergraduate Science Education students find themselves as teachers in trainee by co-incident. This is because they were offered admission against their choices. As a result, most of them do not want to develop their career in teaching. The implication of this is that these students which we devote our time, energy and resources to train and develop now, are seeking for any available opportunity to switch career. This is leaving a negative impact on curriculum delivery and continuing education in Nigeria. The recommendation of this study is that schools should ensure that students who are interested and applied to study science educational courses are given top priority in their academic choices as this will boost their readiness, interest and satisfaction for effective curriculum delivery.

Keywords: Choice, Career, Career Choice, Passion, Force-choice, Curriculum Studies, Curriculum Delivery, Lifelong Learning

1. Introduction

1.1 Background to The Study

The quality and standard of a country's educational system is determined by the teacher (Akpochafo 2020), No educational system can rise above the quality of its teacher' (Ekima and Agih 2023). To improve the quality of education, there is the need to improve the quality of teachers who are the major drivers of the educational system of any country. Achieving this means training teachers who have keen interest in developing their career in education through voluntary, progressive, self-inspired pursuit of knowledge and skills as lifelong learning, personal growth and societal impact (Martínez-Moreno and Petko 2024).

Lifelong learning is learning that starts at birth and continues throughout a person's life. Xhensila (2024), sees lifelong learning as learning throughout one's lifespan. Its main goal is to give people the chance to grow to the fullest extent possible so they can fulfill their potential and contribute their fair share to the advancement of society and the economy. All educational and training programs are based on the fundamental idea of lifelong learning. Its idea, which was first presented in UNESCO's Faure Report in 1972, is a fundamental tenet of educational policy and practice that emphasizes the idea that education should be a lifelong process. According to UNESCO (2022), lifelong learning plays a critical role in social inclusion, sustainable development, and individual empowerment.

The four fundamental pillars of lifelong learning, according to UNESCO, are "learning to know, learning to do, learning to live together, and learning to be." These pillars broadened the concept of education to include not only formal education but also non-formal and informal learning opportunities throughout life. The 2030 Agenda for Sustainable Development reflects this vision, especially Sustainable Development Goal 4 (SDG 4), which highlights the need for inclusive and equitable education as well as opportunities for lifelong learning for everyone.

Building inclusive, egalitarian communities, fostering lifelong learning, and attaining high-quality education all depend heavily on teachers (UNESCO, 2023). Teachers' role in lifelong learning include: helping students develop lifelong learning mindsets, encouraging self-regulated learning, creating positive learning environments, encouraging ethical and meaningful use of technology, and helping students develop growth mindsets (Wongwanich, Wirathep and Archanya 2024). Achieving this, means training up teachers who have keen interest in choosing a career in education.

Career can be described as a near-life commitment, a profession embarked upon by an individual after acquiring a professional training and is licensed and practice under the regulatory (Nwodoh and Ugwu 2024). It is the pursuit of interests, abilities, and objectives over an extended period of time, usually within a particular business or subject. Education or vocational training usually serves as the foundation for career development, with entry-level jobs that enable people to advance their skills (U.S. Bureau of Labor Statistics. 2020)." Put simply, career involves training for a life input and output skill/knowledge through which one's life goals is achieved satisfactorily. For teachers to excel in their teaching career for lifelong learning, they need to be intrinsically motivated in making their choices.

Choice is the act of selecting between alternatives, reflecting autonomy and free will. It is the existence of two or more prominent discriminative stimuli, at least one of which is reasonably efficient (Breeze and Joshy 2023). Choices can be differentiated based on how salient the options are to the observer and how likely it is that at least one of them will elicit a reaction in comparison to the other stimuli. It is implied that there are circumstances in which there is no choice because choosing entails a number of conspicuous possibilities or scenarios that make choice to be either a free-choice and or forced-choice (Toby , Yu, Garry and Daniela 2006).

The choice of teaching career in Nigeria can be likened to an instance that a man who is heavily pressed, walks to the restaurant to use the restroom and finds the men's room door marked "out of order." Thus, he either keeps gazing at the men's restroom which is out-of-order sign or uses the women's restroom door. We probably wouldn't state that the two prominent discriminative cues indicated a choice, and the man will most likely continue on. However, if the man's circumstances were bad enough, he might storm into the women's room, showing that the stimulus was discriminatory enough to elicit a response. This might be the case of majority of the undergraduate students of Science Education in Nigeria. They may likely face the option of forced choice as majority of the career choice might be institutionally determined, with the students left with no choice than to accept what is offered. This might have a deterring effect on the interest of the students thereby having a negative effect on their achievement and interest to practice as a teacher which eventually will have effect on the 2030 Agenda for Sustainable Development.

There is an alarming outcry on the continuous decline in the performance of students in sciences (biology, chemistry and physics) in external examinations (WAEC and NECO) in Nigeria. A lot of researches have been conducted to determine the cause as well as to for store a lasting solution to this menace, Researches have revealed that the students environmental as well as the teacher factors have been ascribed as the factors leading to this poor performance. Researches available to the researcher revealed that little or no researches have been conducted on the factors that influenced the career choice of science education teachers in Edo State in Nigeria. If the career choice of the teacher was a forced-choice, there is the tendency for the teacher to lose interest in the profession thereby resulting in the teachers' low output which might eventually have effect on the performance of the students. This research becomes timely for curriculum implementation. If the 2030 Agenda for Sustainable Development goal is to be achieved, as well as the menace of students' poor performance is to be addressed, there is the need to ensure that students who are interested in teaching profession are admitted, trained and encourage to grow and develop their teaching career as a lifelong learning as well as helping the younger generation to develop lifelong learning mindset. To achieve this, there is the need to investigate the factors that influenced the career choice of undergraduate Science Education students of the University of Benin, Benin City. The essence is to recommend those would-be teachers who were forced into teacher education programme for occupational

therapy that can help re-orientate and re-integrate them into teacher education for lifelong learning.

1.2 Statement of the Problem

It has become a common exercise in our society today to see career choice of an individual been influenced by some factors directly or indirectly, leaving either positive or negative effects on a child's career progression and lifelong learning. An observation from classroom teachers in Edo State reveals teachers who do not have passion for the profession. Other factors include the exodus of teachers to other professions (Ahmed, Olamoyegun, Ajemba and Ogunode 2022). This has left a vacuum especially in the sciences in public schools as most schools do not have adequate science teachers (Abubakar, Abiodun & Ogunode 2021).

If teaching is undertaken as a lifelong career, why is it that Nigerian Science classrooms lack the adequate science teachers? What is happening to the good numbers of science teachers graduating from our higher Institutions? is it that teaching is not their calling and choice? Could it be that students who are being trained to be teachers do not want to take the teaching profession as a career? A recalling trend in science education department is that majority of the students who came in through year one leaves the department to other courses through transfer at their second year. Majority of the students remaining are those who couldn't cope with the courses they were admitted to study and so are transferred from other department to science education. If someone is made to function in a profession that he/she is not interested in, the tendency of weak performance cannot be overruled. Could this be the reason while why there is a decline in the performance of students in the sciences in external examination? Could it be that the zeal to teach effectively is not in the teachers because teaching is not their calling and they never opted to be a teacher? To solve the problem of students' poor performance in the Sciences in external examination, there is the need to start addressing the root cause of the problem, so that a permanent solution can be recommended. Hence, the need 'to investigate the factors that promote the career choice of undergraduate science education students of the University of Benin'

1.3 Research Questions

The following research questions will guide this study:

- What are the factors influencing the career choice of undergraduate science education students?
- What percentage of Science Education students were admitted into their chosen career choice?
- What percentage of the sampled population wants to remain in teaching profession after graduation?

1.4 Significance of the Study

This study will be significant to the schools as well as students.

To the school, this study will help the school to identify the factors that promote her students' choice of teaching career early enough to enable the management render the necessary guidance and counseling that will enable the students overcome any Forced choice. It will form a basis on-which career counseling will be conducted on incoming students to enable them have a smooth beginning.

To the students, this study will enable them to align their career choices rightly, not on forced choice but on their own interest, thereby boosting their success in the profession and helping to promote lifelong learning which will eventually improve the standard of living from all perspectives as the man power needed to develop every sector are all trained by teacher.

1.5 Scope of the Study

This study is designed to cover the factors that influence the career choice of undergraduate student. It is delimited to all 100 level Science Education students of the university of Benin 2024/2025 academic session

1.6 Theoretical Framework

Ginzberg's Theory serves as the theoretical foundation for this investigation. Ginzberg was a psychologist and expert in human development. He divides human development into phases or stages according to developmental milestones and age. According to him, individuals go through three stages of career development that generally match the stages of human development.

Fantasy stage: This lasts from birth to about age eleven, youngsters engage in role-playing and pretend games, mimicking adults and aspiring to be like them without having a realistic idea of what a vocation entails.

The tentative stage (ages 11 to 17): Children start to comprehend their own preferences, skills, and abilities as they grow.

Realistic stage (ages 17 to 24): Here, young adult decides on a job. Three "sub-stages" can be distinguished within this stage:
i. Exploration: Through educational options and exposure to the realities of life, the young adult starts to experience potential career alternatives.
ii. Crystallization: When a young adult is exposed to the realities of their profession choice, they grow more certain about it. A lot of people stay in this phase of their careers.

Specification: The young adult recognizes particular specializations within their field of choice. For instance, a student pursuing a nursing degree will recognize that there are numerous kinds of nurses and adjust their education to specialize in a field that aligns with their educational preferences and personal values.

This theory is relevant to this study because it outlined the various stages of career development that students have actually encountered and where they are now, where they would be later on in their career. Science education students have made their choice of becoming a teacher. They are in their crystallization stage, been exposed to the realities of their choices. Some of them might remain at this stage while others might move to the specification stage. Some might take up a different career pathway in life thereby leading to reduction of man-power in the teaching profession. Identifying the factors that prompted their career choice would help the institution re-orient them into teaching profession for better productivity, achievement and impact.

2. Factors Influencing Students Career Choice

A child's professional choices may be influenced by their parents. Parents are frequently the most important people in a child's life from an early age, acting as role models and decision-makers in addition to offering emotional support. The pathways that children examine and ultimately choose can be significantly influenced by the parents' values, expectations, social standing, educational background, and even occupations (Nwodoh and Ugwu 2024). As a way to gain acceptance or affirmation, children frequently absorb their parents' goals and objectives and work to achieve them. Anieche, Standley and Obidife (2022), in their research conducted to assess the factors influencing the Choice of Nursing as Career amongst undergraduate Students in Nursing Training Institutions in Anambra State Nigeria, identified family pressure, parental approbation, and emotional factors as factors influencing students' career choices. Similar results were also found by Njenga, Kaaria and Katiba (2018), also discovered similar findings and stated that parent child relationship is of paramount importance as it reinforces positive affirmations on their children career choice.

Strong association between mentoring and family relationships and career choice was found by (Kehinde, Olufunmilayo and Damilare 2021, Adikwu and Ereka 2022, Udoh and Sanni 2012).

Other factors influencing career choice include: peer group influence and personal factor like interest. Peer groups are important in influencing students' career choices, particularly in adolescence and early adulthood. Students spend a lot of time with their peers in social and academic contexts, and as a result, they are frequently influenced, consciously or unconsciously, by the attitudes, values, and aspirations of their friends Okudo, Obumse, Aniebo and Obiekwe (2025). Okafor and Onokwai (2020), sees this variable as not significant in the determination of career choice of students.

Interest is one of the most crucial personal characteristics influencing the career choice of students. Students are more likely to be motivated, content, and successful when they select occupations that align with their interest. In most cases students' career choice and interest are affected by their families' social economic level.

Students' admission offers also have a great influence on the career choice of students by shaping the opportunities available to them and often determining the direction of their academic and professional paths. This is usually done through non-availability of preferred programs (Iduseri and Osemwenkhae 2022). This makes them accept admission into a related or entirely different program, which can shift their career path. This may leave adverse effect on their interest and outcome both as a student and teacher. It becomes paramount to aligning admission with applicants' aspirations especially when applicants meet the requirement for admission. According to Suhlmann et al. (2018), addressing this mismatch will help sustain students' interest, boost their outcome and motivate them to develop their career in teaching.

3. Research Methodology

3.1 Design of the study

This study uses the survey research design to investigate the factors influencing the career choice of undergraduate science education students of the University of Benin, Benin City.

The population of this study comprised of all 100 level undergraduates offering Science Education with the 2024/2025 academic session. They comprised of students studying Education and Biology, Physics, Chemistry and Integrated Science with a total of 193 students who were successfully cleared into 100 level in the 2024/2025 academic session.

Census sampling technique was adapted for this study. The breakdown is presented in table 1

Table 1: Students enrollment into the various Science Education options

S/N	Course Area	Population
1	Education and Biology	78
2	Education and Chemistry	26
3	Education and Physics	21
4	Education and Integrated Science	68
	Total	193

Source: Office of the Exam Officer, CIT Department, UNIBEN.

A likert scale questionnaire titled "Career Choice Determining Factors" (CCDF) was used as the data collection tool. CCDF is a likert scale with four options -strongly agree, agree, disagree, and strongly disagree in part B, which solicited the factors that influenced the students' profession choices. Whereas section A asked for the students' demographic data.

Three lecturers, two from the Department of Curriculum and Instructional Technology and one from the Department of Educational Management, Faculty of Education, University of Benin, Benin City validated the face and content validity of the CCDF questionnaire.

By giving the test to students who were not included in the study's sample, the instrument's reliability was determined. Cronbach Alpha was used for data analysis. A reliability score of 0.76 was attained, indicating the instrument's reliability. The students were given a brief explanation of how to complete the instrument before the researchers administered it.

The researchers who are lecturers in the department of Curriculum and Instructional Technology personally administered the instrument to the students. Students were given time to answer the questionnaire after which, the questionnaires were retrieved from the students. Items in CCDF were scored and analyzed using descriptive statistics of simple percentage and mean. Findings of the research are presented:

4. Presentation of Findings

Research Question 1: What are the factors influencing the career choice of undergraduate science education students?

Table 2: Frequency and percentage occurrence of factors influencing the career choice of Science Education students

S/N	Factors influencing the career choice of Science Education students	Opinion	Frequency	Percentage	Decision
1	My parents' expectation for me is to be a teacher	Strongly Disagree	86	44.6	Disagree
		Disagree	76	39.4	
		Agree	23	11.9	
		Strongly agree	8	4.1	
		Total	193	100	
2	Since my childhood, my parents has been educating me on the value of being a teacher	Strongly Disagree	82	42.5	Disagree
		Disagree	93	48.2	
		Agree	10	5.2	
		Strongly agree	8	4.1	
		Total	193	100	
3	I choose to be a teacher because my mother /father is a teacher	Strongly Disagree	118	61.1	Disagree
		Disagree	69	35.8	
		Agree	3	1.6	
		Strongly agree	3	1.6	
		Total	193	100	
4	I choose to read science education because I am well encouraged and supported by my parents	Strongly Disagree	59	30.6	Disagree
		Disagree	65	33.7	
		Agree	52	26.9	
		Strongly agree	17	8.8	
		Total	193	100	
5	I feel I am under pressure by my parents to study and become a teacher	Strongly Disagree	132	68.4	Disagree
		Disagree	48	24.9	
		Agree	8	4.1	
		Strongly agree	5	2.6	
		Total	193	100	
6	Because teaching is a noble profession, I chose to became a teacher	Strongly Disagree	66	34.2	Disagree
		Disagree	75	38.9	
		Agree	44	22.8	
		Strongly agree	8	4.1	
		Total	193	100	
7	I choose to study Education because I want to be like my friends who are aspiring to be a teacher	Strongly Disagree	118	61.1	Disagree
		Disagree	69	35.8	
		Agree	1	0.5	
		Strongly agree	5	2.6	
		Total	193	100	
8	I choose to become a teacher because my friends see teaching profession as prestigious	Strongly Disagree	93	48.2	Disagree
		Disagree	85	44	
		Agree	14	7.3	
		Strongly agree	1	0.5	
		Total			
9	I chose to study education because teachers are well respected in my society	Strongly Disagree	80	41.5	Disagree
		Disagree	94	48.7	
		Agree	14	7.3	
		Strongly agree	5	2.6	
		Total	193	100	
10	I choose to study education because it aligns with my personal interest	Strongly Disagree	61	31.6	Disagree
		Disagree	74	38.3	
		Agree	38	19.7	
		Strongly agree	20	10.4	

		Total	193	100	
11	I love teaching profession because it pays well, the salary scale for teachers is attractive	Strongly Disagree	112	58	Disagree
		Disagree	70	36.3	
		Agree	9	4.7	
		Strongly agree	2	1	
		Total	193	100	
12	I choose teaching profession because it will allow me to create a balance between my work and personal life.	Strongly Disagree	52	26.9	Disagree
		Disagree	83	43	
		Agree	40	20.7	
		Strongly agree	18	9.3	
		Total	193	100	
13	I choose teaching profession because it will give me an avenue to help humanity	Strongly Disagree	34	17.6	Disagree
		Disagree	77	39.9	
		Agree	45	23.3	
		Strongly agree	37	19.2	
		Total	193	100	
14	I am studying education because it is the course I chose as my first choice in JAMB	Strongly Disagree	125	64.8	Disagree
		Disagree	52	26.9	
		Agree	2	1.0	
		Strongly agree	14	7.3	
		Total	193	100	
15	My institution offered me admission to study Education against my choice	Strongly Disagree	27	14	Agree
		Disagree	12	6.2	
		Agree	32	16.6	
		Strongly agree	122	63.2	
		Total	193	100	
16	The ease of finding employment as a teacher made me chose a career in teaching.	Strongly Disagree	87	45.1	Disagree
		Disagree	76	39.4	
		Agree	28	14.5	
		Strongly agree	2	1.0	
		Total	193	100	
17	I will want to remain and develop my carrier in teaching after graduating from my B.Sc. (Ed) programme	Strongly Disagree	67	34.7	Disagree
		Disagree	56	29.0	
		Agree	39	20.2	
		Strongly agree	31	16.1	
		Total	193	100	

Key: When the percentage of agree+ strongly agree is ≥ 50 = Acceptance.

Table 2 revealed the factors influencing the career choice of Science Education students of the University of Benin.

The table revealed a very high percentage disagreement with almost all the items in the instrument except item 15 where students had a percentage acceptance of 63.2 of strongly agree and 16.6 agree. This gave a total of 79.8% acceptance.

To validate the findings of this research, a mean statistics was done on the items based on subject areas. This is shown in table 3.

Table 3: Mean opinion of students on their choice of teaching profession based on subject areas.

Education/courses	Mean Per Items																
	Item	Item	Item	Item	Item	Item	Item	Item	Item	Item	Item	Item	Item	Item	Item	Item	Item
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Biology N=78	1.8	1.8	1.5	2.2	1.4	2.1	1.5	1.6	1.8	2.0	1.4	2.3	2.5	1.6	3.0	1.6	2.0
Inter.SC N=68	1.8	1.6	1.5	2.1	1.4	1.9	1.4	1.6	1.5	2.1	1.5	1.9	2.4	1.4	3.4	1.8	2.3
Chemistry N=26	1.3	1.3	1.0	1.8	1.0	1.5	1.1	1.2	1.7	2.0	1.3	1.9	2.1	1.1	3.2	1.4	1.9
Physics N=21	1.7	1.5	1.4	2.0	1.6	2.0	1.5	1.8	1.7	1.9	1.7	2.0	2.2	1.4	3.3	1.8	3.5

Key: When the mean of item is ≥ 2.5=acceptance

Table three presented the mean acceptance of factors influencing the career choice of undergraduate Science Education Students.

To Education and Biology students, revealed a mean performance of less than 2.5 across all the items except items 13 and 15 which presented a mean of 2.5 and 3.0 acceptances. To Education and Integrated Science students, a mean of less than 2.5 was recorded across all the items except item 15 which presented a mean of 3.4 acceptances. Education and Chemistry students also presented similar findings in all the items except item 15 which presented a mean acceptance of 3.2. To Education and Physics students, only items 15 and item 17 revealed a mean acceptance of 3.3 and 3.5 respectively. The findings showed that the career choices of Science Education Students of the University of Benin were determined by the Institution offer of admission against the students' choices.

Research Question 2: What percentage of Science Education (Biology) students were admitted into their chosen career choice?

From table 2, item 14, 14 students, with a percentage of 7.3 and 2 students with a percentage of 1.0 responded to strongly agree and agree respectively. From table 3, Item 14, the mean responses of students across the Science Education options are 1.6, 1.4, 1.1 and 1.4 for Biology, Integrated Science, Chemistry and Physics respectively. This showed that 91.7% of the total 193 students cleared into Science Education in 2024/2025 session did not apply to study Education course.

Research Question 3: What percentage of the sampled population wants to remain in teaching profession after graduation?

From table 2, item 17, 31 students with a percentage of 16.1 and 39 students with a percentage of 20.2 responded to strongly agree and agree respectively while 56 students with a percentage of 29 and 67students with a percentage of 34.7 responded to disagree and strongly disagree respectively. This showed that only 36.3 percent of the sampled population wants to remain and develop their career in teaching profession after graduation. Considering the mean dispersion across the various Science Education options in table 3, a mean response of 2.0, 2.3, 1.9 and 3.5 were recorded for Biology, Integrated Science, Chemistry and Physics Students respectively.

5. Discussion of findings

Findings from this research revealed that students studying Science Education career choice were not influenced by parental factor, nor peer influence, neither were the choice of teaching career their personal choice. This finding agrees with Okafor and Onokwai (2020) who sees peer influence as not significant in the determination of career choice of students but disagrees with Okudo, Obumse, Aniebo and Obiekwe (2025) who sees peer influence as positive factor on students' career choice. This finding contradicts the findings of (Anieche, et.al 2022, Nwodoh and Ugwu 2024, Okafor and Onokwai 2020, Njenga et.al 2018) who discovered that Parental expectations and influence have an impact on nursing students' career choices.

Findings from (Kehinde, Olufunmilayo and Damilare 2021, Adikwu and Ereka 2022, Doghonadze, Bello and Aliyer 2025), additionally refuted the results of this investigation. Their findings revealed that family relationship, guidance and parent perception has significant effect and relationship on their children choice of career. The disparity in their findings may be because parents hold nursing profession with high

esteem as compared to teaching profession in Nigeria. This may be because teachers are looked down upon in our society. As a result, parents fail to orientate their children on the need to be a teacher. This assertion conforms with Udoh and Sanni (2012), who revealed that parents' attitudes towards occupations has effect on secondary school students' choice of career. Christensen et.al (2022) also discovered similar findings and stated that parents are less inclined to support their kids in pursuing careers as teachers.

Doghonadze, Bello and Aliyer (2025), stated that parent poor perception of teaching as a career has a great effect on their choice of teaching profession for their children. This affects the orientation and encouragement they give to their children as it concerns to teaching profession.

Findings from this study revealed that 91.7% of the sampled students do not apply to their institution to study educational course. Their career choices were influenced by the course they were offered to study by their university. Based on this finding, we can state that because teaching profession does not pay well in Nigeria, and that it lacked good reputation in our society, this generation of students, were not encouraged by their parents nor were they motivated intrinsically or extrinsically to be a teacher. As a result, they all opted for other career choices in their application. Findings from this study revealed that these undergraduate science education students find themselves as teachers in trainee by coincidence. These students were offered admission against their choices. As a result, most of them do not want to develop their career as a teacher. Iduseri and Osemwenkhae (2022), posited that overwhelming urge to gain admission makes students accept admissions into disciplines that are not their choices. The implication of this is that these students which we devote our time, energy and resources to train and develop now, are seeking for any available opportunity to switch career. This is evident in their response to item 17 which solicited students' interest to develop their career in teaching after graduation. The findings revealed that only 36.3% of the students are willing to develop their career in teaching while 63.7% of these students are waiting for the slightest opportunity to switch career.

5.1 Implication for Curriculum Studies and Lifelong Learning

A nation that has teachers, that took teaching career by coincident will not but lament poor performance of students in examination. This is because effective curriculum delivery requires readiness, interest and satisfaction. These features play a significant role in teachers' ability to comprehend and deliver lesson content in class. Today, the qualities of teachers are queried, while the performance of students in external examination is dwindling. There is mass exodus of teachers outside the country and to other professional disciplines. Findings from this research is a testament that these students which we devote our time, energy and resources to train and develop now, are seeking for any available opportunity to switch career. This will continue to leave a negative impact on curriculum delivery and continuing education. In Nigeria, Curriculum delivery is left in the hands of those who are not happy being what they are. This is so because teachers who are not interested in teaching are now doing the job of teaching. If this trend is not curbed, we will continue to have decline in the number of science teachers as well as record poor performance of students in sciences in external examinations. This is because students' performance is a true reflection of the nature of education, which has the nature of teachers, classroom environment and learning facilities as major parameters for its evaluation.

6. Recommendations

The following recommendations are made from the findings of this research:

- Awareness campaign should be conducted on the importance of teacher education both for students, parents and the society at large;
- Government should prioritize teacher education programme through scholarships bursaries
- The government should boost the status of Nigerian teachers through good salary package, good working environment and scholarships bursaries for students studying education at the universities.
- Institutions should ensure that those admitted into education programme actually applied to study education in their institution.

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Linking Organisational Climate to Students' Academic Performance: Evidence from Lagos State Senior Secondary Schools, Nigeria

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Abstract. This study examined the relationship between organisational climate and students' academic performance in Lagos State senior secondary schools, Nigeria. The study adopted a survey research design with a correlational approach to enable the collection and analysis of quantitative data on the relationship between the variables. The population comprised 8,956 teachers across 326 public senior secondary schools in Lagos State. A sample of 480 teachers was determined using the Taro Yamane formula, including an additional 20% to account for non-response. A multi-stage sampling technique was employed, involving the selection of 30 schools across six education districts and 16 teachers from each school. Data were collected using a structured questionnaire and records observation. Organisational climate was measured using the adapted Organisational Climate Index (OCI) developed by Megan Tschannen-Moran (2006), while students' academic performance was assessed through records of credit passes in five subjects, including English Language and Mathematics, in the West African Senior School Certificate Examination from 2020 to 2022. The validity of the instrument was established through Confirmatory Factor Analysis, with a Kaiser-Meyer-Olkin value of 0.944 and a significant Bartlett's Test of Sphericity ($\chi^2(45) = 16{,}154.902$, $p < .01$). Reliability analysis yielded a Cronbach's alpha coefficient of 0.96, indicating excellent internal consistency. Data were analysed using the Statistical Package for the Social Sciences (SPSS), employing descriptive statistics and Pearson's Product-Moment Correlation and multiple regression analysis at the 0.05 level of significance. Findings revealed a significant positive relationship between organisational climate and students' academic performance ($r = 0.628$, $p < 0.05$). Further analysis showed that community engagement emerged as the strongest positive predictor ($\beta = 0.490$), followed by collegial leadership ($\beta = 0.285$) and academic press ($\beta = 0.275$), while teacher professionalism showed a significant negative influence ($\beta = -0.383$). The study concluded that organisational climate is a major determinant of students' academic performance. It was recommended that educational authorities promote policies that enhance collegial leadership, strengthen school-community partnerships, and foster supportive school environments to improve academic outcomes.

Keywords: Organisational Climate, Students' Academic Performance, Community Engagement, Collegial Leadership, Academic Press, Teacher Professionalism.

1. Introduction

Education remains a fundamental pillar of human development and societal progress, serving as the mechanism through which individuals acquire the knowledge, skills, and competencies necessary for effective participation in society. It is widely acknowledged as the bedrock of national development, enabling individuals to become self-reliant and contribute meaningfully to socio-economic advancement (Alade et al., 2017). Within the educational system, students' academic performance constitutes a central indicator of educational effectiveness and success. Academic achievement is commonly used as a benchmark for evaluating learners' outcomes and the overall productivity of schooling, with high-performing students often perceived as possessing greater intellectual capacity and potential for societal contribution (Ali et al., 2009). Consequently, the academic performance of

students is closely linked to national development, as it determines the quality of human capital available for economic and social transformation (Alade et al., 2017).

Over time, scholars and policymakers have devoted considerable attention to understanding the determinants of students' academic performance. Various factors have been identified, including individual attributes such as intelligence and motivation, as well as contextual variables like family background, parental involvement, and socio-economic status (Kitonyi, 2013). While these factors are undeniably important, increasing emphasis has been placed on school-related variables, particularly the role of teachers and the broader academic environment. Teachers occupy a central position in the teaching-learning process, and the quality of an educational system is often considered inseparable from the quality of its teaching workforce (Saka, 2021). Effective teaching practices, sustained student engagement, and the ability to respond to learners' needs are critical for enhancing academic outcomes (Mat-Salleh et al, 2020).
However, the effectiveness of teachers is not solely dependent on individual competence but is also shaped by the organisational context within which they operate. In many secondary schools, teachers are faced with heavy workloads, large class sizes, and the expectation to handle multiple subjects, which can adversely affect instructional delivery and, ultimately, students' academic performance (Babalola & Agbaje, 2019). Furthermore, the traditional practice of isolated teaching limits collaboration among educators and may hinder the sharing of knowledge, skills, and innovative practices necessary for improved learning outcomes (Goddard et al, 2007; Adeyemi, 2017).

In the school system, the concept of organisational climate has emerged as a critical factor influencing both teacher effectiveness and student achievement. Organisational climate refers to the shared perceptions, attitudes, norms, and interpersonal relationships that characterize the social and emotional environment of a school (Maxwell et al., 2017). It encompasses key elements such as teacher-student relationships, collegial collaboration, leadership practices, availability of resources, and the overall culture of learning within the school environment (Amsalu & Belay, 2024). A positive organisational climate fosters motivation, engagement, and a sense of belonging among students, thereby enhancing academic performance. Conversely, a negative climate characterized by poor communication, limited support, and low expectations can undermine both teaching effectiveness and students' academic success (Ramazan et al., 2023; Amsalu & Belay, 2024).

Empirical evidence has consistently demonstrated that organisational climate significantly influences teachers' effectiveness, job satisfaction, and commitment (Babu & Kumari, 2013; Selamat et al., 2013; Khan, 2019; Narad et al., 2020). Given that effective and motivated teachers are essential for quality instruction and improved student outcomes, the organisational climate of schools becomes a crucial determinant of academic performance. Therefore, understanding how organisational climate shapes students' academic achievement is essential for improving educational practices and outcomes, particularly in the context of senior secondary schools in Lagos State, Nigeria.

1.1 Statement of the Problem

Students' academic performance remains a central concern in educational systems, particularly in developing contexts such as Nigeria where it serves as a key indicator of educational quality and national development. Despite extensive research on the determinants of academic achievement, existing literature has largely focused on isolated factors, with limited attention to the combined influence of school-based organisational variables. In particular, organisational climate has been examined in relation to outcomes such as teachers' job performance, communication, and educational innovation (Abari, 2003; Okoye, 2012; Adejumobi & Ojikutu, 2013; Taiwo, 2014), while only a few studies have explored its direct link with students' academic performance (Enwezor, 2021). This fragmented approach has created a gap in understanding how the internal environment of schools holistically shapes students' learning outcomes.

Furthermore, although organisational climate is widely acknowledged as a critical component of the school environment, empirical evidence on its direct influence on students' academic performance, particularly within Lagos State senior secondary schools, appeared to remain insufficient and inconclusive. Schools differ significantly in terms of their social relationships, norms, leadership practices, and resource availability, all of which constitute organisational climate and may differentially impact students' academic success. However, the extent to which these climate-related factors contribute to variations in students' performance has not been adequately investigated within the Nigerian context.

Given these gaps, there is a compelling need for systematic empirical inquiry into the role of organisational climate in shaping students' academic performance. Without such evidence, efforts by educators and policymakers to improve learning outcomes may remain inadequately informed. Therefore, this study seeks to address this problem by examining the influence of organisational climate on students' academic performance in Lagos State senior secondary schools, Nigeria, with a view to providing evidence-based insights for improving educational practices and outcomes.

1.2 Purpose of the Study

The main purpose of this study is to examine organisational climate as it relates to students' academic performance in Lagos State senior secondary schools, Nigeria. Specifically, the study seeks to:

- determine the extent to which organisational climate influences students' academic performance in Lagos State senior secondary schools; and
- analyse students' academic performance in relation to organisational climate as a predictive factor in Lagos State, Nigeria.

1.3 Research Hypotheses

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

Ho_1: There is no significant relationship between organisational climate and students' academic performance in Lagos State Senior Secondary Schools, Nigeria.
Ho_2: There is no significant relative influence of organisational climate dimensions on students' academic performance in Lagos State Senior Secondary Schools, Nigeria.

2. Literature Review

2.1 Overview of Organisational Climate

Organisational climate has been variously defined. Thompson (2010) describes organisational climate as an approach in which organisational members observe and characterize their surroundings and environment in an attitudinal and value-based manner. For Narad *et al.* (2020), organisational climate implies "a set of perceived attributes of an organisation and its subsystems as reflected in the way an organisation deals with its members, groups and issues". In the educational setting, organisational climate refers to the mixture of interpersonal interaction among the stakeholders of the institutions including teachers, parents, students and others. As mentioned by Hoy, Tarter and Kottkamp (1991), there are two dimensions of interpersonal interactions which are closely related to organisational climate; principals' leadership behaviour and teachers' behaviour. The four dimensions of principals' leadership behaviour are warmth, production emphasis, trust and consideration while the four dimensions of teachers' behaviour are engagement, enablement, esprit de corps and intimacy.

Organisational climate also refers to "a set of characteristics that describe an organisation, distinguishes one organisation from another, is relatively stable over time and can influence the behaviour of the organisation's members" (Eustace & Martins, 2014). Every educational institution has a unique personality or climate of its own. Marshall (2002) viewed school organisational climate as a multidimensional environmental factor that influences many individuals, including students, parents, school personnel, and the community, stressing that it is a belief system or culture that underlies the day-to-day operation of a school. School climate, according to Marshall, is influenced by factors such as the number and quality of interactions between adults and students, students' and teachers' perceptions of their school environment, or the school's personality. Other factors include, the environmental factors such as the physical buildings and classrooms, instructional materials, academic performance, feelings of safety, school size and feelings of trust and respect for students and teachers. A positive school climate therefore exists when students and teachers feel comfortable, wanted, valued, accepted, and secured.

The Concept of organisational climate was first employed in the 1960s by George. He was the first psychologist who saw the analogy with individual personality and used the Concept of organisational climate. Since George, the Concept of organisational climate has been variously examined and defined. For instance, Tagiuri and Latwin (1968) defined organisational climate as "the quality of an organisation's internal environment, especially as experienced by the insider." Organisations differ in their form and structure. In this study, however, the focus is on school organisations, which are mostly formal organisations. Formal organisations are deliberately planned, created, and concerned with the deliberate coordination of the activities of multiple people through a division of labour, functions, and hierarchies of authority and leadership to achieve a common stated purpose or goal (Lacks, 2016).

School climate is one of the key factors that contribute to the overall success of any school. It involves cooperation between human resources, physical resources, and material resources. Adeogun and Olisaemeka (2011) define school climate as a comprehensive measure of school characteristics such as relationships with parents, teachers, administrators, and on-site physical facilities. A school's climate deals with values and attitudes of persons within completely different subsystems existing within the school, teachers, non-teachers, and other categories of staff, parents, and students. One can think of the school climate as a fertile land where seeds are sown earlier to get greater fruits later. The quality of seeds may be high, the grower may be technically competent, and financial resources may be available. However, everything depends on the fertility of the soil to grow and flourish. The same is true of the organisational climate of educational institutions. An organisation is, made up of more than one individual. Although the climate of an organisation may not be a replica of the sum of individual personalities, it is however affected by the constituent individuals.

In the same way, the climate of an organisation affects the personalities of the individuals associated with the organisation. Therefore, a two-way process goes on in which individuals and organisations interact with each other. According to Lacks and Watson (2018), a healthy school continuously strives to bring satisfaction among its members, teachers, and non-teaching staff, providing a better organisational climate quality. It makes the school a challenging and interesting learning centre for students, teachers, principals, and achievements of students in curricular and co-curricular activities and a centre for the inculcation of social sensitivity and values (Lacks & Watson, 2018).

2.2 Concept of Students' Academic Performance

Students' academic performance is the main feature and one of the important goals of education (Rono et al, 2014; Narad & Abdullah, 2016). It is defined as knowledge gained by students, assessed through marks given by a teacher and/or learning goals set by students and teachers to be achieved over a defined period (Kumar *et al.*, 2021). Ensuring that students attain academic excellence through better academic performance is the primary motive of academic institutions (Kumar *et al.*, 2021). Indeed, academic performance can be understood as the nucleus around which several significant components of the education system revolve.

The Concept of academic performance can be defined in terms of gaining knowledge; acquiring skills and competencies; securing high grades and similar academic achievements; securing a progressive career; and intention and persistence toward education (York *et al.*, 2015). Anene (2005) defined students' academic performance as an assessment of students learning progress in tasks required of them. Academic performance is often gauged through examinations and tests. They are expected to engage in activities that may include manipulation of materials, problems solving, demonstration of practical skills, and participation in theoretical work.

Since sound academic performance is considered a prerequisite for securing good jobs, a better career, and a quality life, the significance of students' academic performance is enormous. While it may seem like a simple educational outcome, the impact of students' academic performance on national development is multi-faceted. Narad and Abdullah (2016) found that at the basic level, any academic institution's success or failure depends largely on the academic performance of its students. Narad and Abdullah (2016) also emphasised the general belief that good academic performance signals better career prospects and, thus, a secure future.

Students' academic performance is immensely significant as any country's economic and social development is attributable to it. The better students perform academically, the better the prospects of developing a fine workforce that will contribute to national economic and social development (Kumar *et al.*, 2021). Students who perform better than society's expectations and norms are expected to contribute to society's growth, development, and sustainability (Akinleke, 2017).

2.3 Organisational Climate and Students' Academic Performance

Research has identified school climate as a factor influencing the success or failure of education among teachers and students (Adesina, 2011). Academic performance is the measured output of students' learning in a school or academic institution. Adewale (2003) described academic performance as a means of academic progress, not only to indicate readiness for the next step but also to evaluate students' progress toward educational goals. It is also a measure that determines whether a student will remain at the same level in the coming year or be promoted.

Ezewor (2021) lamented that the products of today's secondary system could neither usefully live-in

society nor move into higher institutions without result forgery or their parents' buying admission with a huge sum of money. Senior Secondary School students cannot think for themselves or respect the views and feelings of others, and they have no dignity of labour except for things that will give them quick money. They are highly engaged in cultism, drug abuse, examination malpractices, hooliganism, truancy, high drop-out rate, sexual harassment, and general breakdown of law and order of the day.

Notwithstanding these vices, the teeming population of public Senior Secondary School completers across the country every year is alarming. This trend is connected with the prevailing level of school climate in many public Senior Secondary Schools. Because of the relevance of school climate to students learning and academic performance, this study set out to examine the impact of school climate on the academic performance of Senior Secondary School students in Lagos State, Nigeria. Given the situation of Senior Secondary School education in Nigeria, improving the school climate may be a viable way to improve students' academic performance and the quality of education across the country.

Adeogun and Olisaemeka (2011) also emphasised the link between organisational climate and improved academic performance of students. They found that selected characteristics of school climate, such as; working conditions, learning environment, home-school relationship, socio-physical environment, safety and security, discipline, and teacher care and support, significantly affect teachers' performance and productivity. Dagnew (2014) also found that other features of the school climate, such as teacher-student relationships, student-peer relationships, administration, and academic orientation, significantly affect students' academic performance. Further, Nyamosi (2013) found that the adequacy of teaching-learning resources and interpersonal relationships are aspects of the school climate that influence the performance of both teachers and students.

2.4 Theoretical Framework

This study leans on a theory that explains the relationship between organisational climate and students' academic performance. The theory is the Litwin's and Stringer's theory of organisational climate.

The Organisational Climate Theory was first developed by Litwin and Stringer (1968) to explain how the internal environment of an organisation influences employees' motivation, attitudes, and behaviour. The theory posits that organisational climate refers to the collective perceptions and shared meanings that employees attach to their work environment. These perceptions arise from formal policies, leadership style, communication patterns, reward systems, and interpersonal relationships within the organisation. According to Litwin and Stringer, organisational climate is a key determinant of employee performance because it shapes individuals' emotional and psychological experiences at work. A supportive and participatory climate fosters satisfaction, trust, and commitment, while a rigid or hostile climate can lead to disengagement and low productivity.

Several assumptions underlie the organisational climate theory. First, employees behave according to the way they perceive their organisational environment (including policies, procedures, practice and so on); second, the perceptions of the organisational environment are an outcome of social processes based on interactions and communication between employees and with managers; third, the perceptions of the organisational environment are facet-specific. Facet-specific organisational climate refers to shared perceptions, held by members of an organisation, regarding individual aspects of the organisational environment that communicate what behaviour, related to this facet, is rewarded and supported by the organisation, and to what degree (Zohar & Luria, 2005). Fourth, these facet-specific perceptions help employees understand the relative importance of each facet and thereby make sense of what is expected of them.

Organisational climate captures the sense of imperative, the perceived importance of a facet to members of the group (Luria, 2016). The oldest explanation for the emergence of such a sense of imperative is the top-down process in organisations which focuses on the leader as an important influencer on group climate, first explored in Kurt Lewin's studies (Lewin *et al.*, 1939). Many studies followed this approach, focusing on managers as high influencers of organisational climate (for example., Barling *et al.*, 2002; Kapp, 2012). Zohar and Luria (2005) suggested that the top-down process is hierarchical, starting from the management level commitment to the department-level managers and finally to the operation-level employees. They demonstrated that management-level commitment can be captured by incidents that indicate to organisational members the importance of the facet (in their study, safety). They also demonstrated that in organisations where employees perceive that the management is committed to safety, the employees behave

accordingly in a safe manner. Employees' behaviour is proven to be influenced by specific facets or aspects of organisational climate (Berberoglu, 2018; Amiri *et al.*, 2023).

2.5 Review of Empirical Studies

Shinder, Jones, Williams, Taylor, and Cardenas (2016) examined the relationship between school climate and students' academic performance in public schools in the United States. The study used a purposive sample of 230 schools drawn from five states in the USA and measured school climate using the Alliance for the Study of School Climate (ASSC) School Climate Assessment Instrument (SCAI). The SCAI was designed to achieve an in-depth examination of the health, function, and performance of each school. While the term "school climate" was judged the best description for the intent of the instrument, it examines the construct of climate broadly and includes eight distinct dimensions: School appearance and physical plant; Student interactions; Faculty relations; Leadership decision making; Discipline environment; Learning environment; Attitude and culture and School-community relations. The study found a strong correlation between the quality of school climate and academic performance levels. The study further proved that the quality of the school's climate appears to be the single most predictive factor in any school's capacity to promote student achievement.

Fakunle and Ale (2018) examined school climate as a determinant of students' academic performance in public Senior Secondary Schools in Ekiti State, Nigeria. Using the stratified random sampling technique, the study adopted a sample of 1455 public Senior Secondary School students from 20 Senior Secondary Schools in Ekiti state. Data was collected using a school climate and students' academic performance questionnaire. Results from the study showed that students' academic performance in schools with an open climate significantly differed from the academic performance of students in schools with a controlled climate. The study found a significant relationship between school climate and students' academic performance and concludes that the school climate plays an important role in influencing and stimulating the drive to make pupils learn.

Maxwell (2017) investigated the influence of school climate on student achievement in U.S. secondary schools. The study aimed to determine how dimensions of school climate (safety, relationships, teaching and learning, and institutional environment) relate to student academic outcomes. Using a correlational design and large-scale survey data, the researcher analysed student- and staff-reported climate measures alongside standardized test scores. Multilevel modelling was employed to account for students nested within schools. Results showed that positive school climate dimensions, particularly teaching and learning and student-staff relationships, were significantly associated with higher student achievement after controlling for socioeconomic factors. The study concluded that improving relational and instructional aspects of climate can enhance academic outcomes.

Gottfried (2010) examined the relationship between aspects of school climate and mathematics achievement in urban elementary and middle schools in the United States. The study used administrative attendance and testing records combined with school-level climate indicators to test whether attendance and related climate features predicted achievement. Employing instrumental-variables and regression techniques to address endogeneity, the analysis found that chronic absenteeism and a negative attendance climate have measurable negative effects on student achievement. The study concluded that organisational climate factors tied to attendance are important predictors of academic performance.

Tomaszewski Xiang, and Hung (2024) used nationally representative longitudinal data from Australia to investigate associations among school climate, student engagement, and academic achievement. The aim of the study was to examine sectoral differences and the mediating role of student engagement in the climate–achievement link. Employing structural equation modelling and controlling for prior achievement and socioeconomic status, the study found that positive school climate predicted greater student engagement, which in turn was associated with higher academic outcomes. The study concluded that engagement partially mediates the effect of climate on achievement, and that climate interventions that boost engagement are likely to yield academic benefits.

Straumann (2023) explored the link between school climate and academic achievement in U.S. secondary schools using survey measures of climate and student achievement records. The aim of the study was to test whether perceptual climate differences predict differences in achievement across schools. Using regression analyses and robustness checks, the study reported significant positive associations between perceived school climate and both test scores and attendance. The study concluded that climate improvement programmes should target instructional

support and student–teacher relationships to maximize effects on learning.

Ibrahim (2025) examined school climate and student academic achievement in public secondary schools in Lagos State, Nigeria. The aim of the study was to determine the extent to which school climate dimensions (leadership, teacher collegiality, safety, and parental/community engagement) were related to students' examination performance. Using a descriptive correlational survey design, the study collected questionnaire data from teachers and students across selected Lagos public secondary schools and correlated these with school-level examination results. Findings indicated significant positive relationships between school climate indices and students' academic achievement. The study recommended targeted interventions in leadership development and community engagement to bolster school performance in Lagos.

Ojukwu (2022) examined the influence of school climate on secondary school students' academic outcomes in a Nigerian sample, focusing on attachment, involvement, and institutional supports as climate indicators. The study used a cross-sectional survey design with student questionnaires and school record data; analyses included Pearson correlations and multiple regression. Results showed that positive climate indicators (student attachment and institutional support) significantly predicted higher academic performance. The study concluded that schools that prioritize relational climate and resource allocation may improve student outcomes.

Okolugbo and Obuh (2025) examined managing school climate determinants for improved academic performance in public senior secondary schools in Rivers State. The study used a mixed-methods design combining surveys of school staff and students with case-study interviews of school leaders to identify actionable climate determinants (leadership, teacher professional development, parental engagement). Quantitative analyses (correlations and regressions) found significant positive links between targeted climate determinants and students' examination performance, while qualitative data provided contextualised insights into how leadership practices shape climate. The study concluded that localised, leader-driven climate interventions can be effective in the Nigerian context.

3. Research Methodology

This study adopted a survey research design with a correlational approach to examine organisational climate and students' academic performance in Lagos State senior secondary schools, Nigeria. The design was considered appropriate as it enabled the collection and quantification of data from a sample of teachers and facilitated the examination of the relationship between the study variables.

The population of the study comprised teachers in public senior secondary schools in Lagos State, totalling 8,956 across 326 schools (Lagos State Ministry of Education, 2024). A sample size of 480 teachers was determined using the Taro Yamane (1967) formula, including an additional 20% to account for non-response and incomplete questionnaires. A multi-stage sampling technique was employed. Lagos State was first divided into six education districts. Five public senior secondary schools were randomly selected from each district, giving a total of 30 schools. Thereafter, 16 teachers with not less than 10 years of teaching experience were selected from each school, resulting in a total sample of 480 respondents.

Data were collected using a structured questionnaire and records observation. The questionnaire included sections on socio-demographic characteristics and organisational climate. Organisational climate was measured using the adapted Organisational Climate Index (OCI) developed by Tschannen-Moran (2006), consisting of 28 items across four subscales: collegial leadership, teacher professionalism, academic press, and community engagement. Students' academic performance was measured through records of credit passes in five subjects, including English Language and Mathematics, in the West African Senior School Certificate Examination from 2020 to 2022.

The validity of the organisational climate scale was established using Confirmatory Factor Analysis with Principal Component Analysis and Direct Oblimin rotation. The Kaiser-Meyer-Olkin value was 0.944, and Bartlett's Test of Sphericity was significant ($\chi^2(45) = 16{,}154.902$, $p < .01$), confirming sampling adequacy and suitability for factor analysis. The analysis yielded a four-factor structure explaining 77.93% of the total variance. Reliability of the instrument was determined using Cronbach's alpha, with the organisational climate scale yielding a coefficient of 0.96 and subscale values ranging from 0.92 to 0.94, indicating excellent internal consistency.

Data collection was carried out with the assistance of trained research assistants, and 469 out of 480 questionnaires were successfully retrieved, representing a response rate of 97.7%. Data were analysed using the Statistical Package for the Social

Sciences (SPSS). Descriptive statistics such as frequency counts, percentages, means, and standard deviations were used to summarise the data, while Pearson's Product-Moment Correlation was employed to test the hypothesis at the 0.05 level of significance. Ethical standards were observed through obtaining necessary approvals, ensuring informed consent, and maintaining confidentiality and anonymity of respondents.

4. Results and Discussion

Hypothesis One

Ho1: There is no significant relationship between organisational climate and students' academic performance in Lagos State Senior Secondary Schools, Nigeria.

Table 1: Relationship between Organisational Climate and Students' Academic Performance in Lagos State Senior Secondary Schools, Nigeria

Variables	N	Mean	Std. Dev	r	p	Remark
Organisational Climate	30	106.529	21.697	0.628**	0.000	Significant
Academic Performance	30	64.024	10.374			

The analysis presented in Table 1, revealed a substantial positive and significant relationship between organisational climate and students' academic performance in Lagos State Senior Secondary Schools ($r = 0.628$, $p < 0.05$). This indicates that as the quality of organisational (school) climate improves, students' academic performance also tends to increase. Therefore, the null hypothesis, which states that there is no significant relationship between organisational climate and students' academic performance, is not accepted.

This finding supports Bandura's Social Cognitive Theory, which asserts that human behaviour and performance are influenced by environmental factors. In this case, the school's organisational climate, its leadership, trust, communication, and collaboration, serves as the environmental condition that shapes teachers' and students' motivation and productivity. A healthy school environment therefore enhances teachers' confidence and engagement, leading to improved student outcomes.

This result is consistent with the work of Tschannen-Moran, Parish, and DiPaola (2006), who found that interpersonal trust, collegial leadership, and academic press within schools significantly predict students' achievement levels. Similarly, Malinen and Savolainen (2016) found that teachers working in schools with positive climates reported higher collective efficacy and job satisfaction, conditions that ultimately improve student learning outcomes. The result also corresponds with that of Karaköse (2024) who reported that organisational climate significantly influences student learning through the mediating role of collective teacher efficacy. This implies that school environments characterised by cooperation, shared goals, and supportive leadership not only foster teacher collaboration but also indirectly enhance academic performance through strengthened collective efficacy.

The findings also corroborate evidence from Nigeria. For example, Ibrahim (2025) found a significant positive relationship between school climate and students' academic achievement in Lagos State public secondary schools reported that leadership style, staff collaboration, and student-teacher relationships were strong predictors of student performance. Likewise, Okere (2024) showed that a positive school climate is associated with higher levels of collective efficacy and student engagement among adolescents in Oyo State. Together, these studies confirm that an enabling school environment fosters teacher commitment and student motivation which are crucial for learning.

Hypothesis Two

Ho_2: There is no significant relative influence of organisational climate dimensions on students' academic performance in Lagos State Senior Secondary Schools, Nigeria.

Table 2: Relative influence of organisational climate dimensions on students' academic performance in Lagos State Senior Secondary Schools, Nigeria

Predictor	B	SE	β	t	p	95% CI for B	Tolerance	VIF
Constant	30.048	1.902		15.800	.000	[26.311, 33.785]		
Collegial Leadership	0.579	0.170	0.285	3.401	.001	[0.245, 0.914]	0.172	5.803
Teacher Professionalism	-0.662	0.175	-0.383	-3.781	.000	[-1.006, -0.318]	0.118	8.489
Academic Press	0.700	0.242	0.275	2.892	.004	[0.224, 1.175]	0.134	7.473
Community Engagement	1.003	0.178	0.490	5.635	.000	[0.653, 1.353]	0.159	6.282

The multiple regression analysis examined the relative influence of the four subscales of organisational climate, community engagement, teacher professionalism, collegial leadership, and academic press, on students' academic performance. The results showed that the model was statistically significant ($R^2 = 0.44$, $p < .001$), indicating that the four subscales jointly explain 44% of the variation in academic performance.

Individually, all four subscales made significant influence on the model. Community engagement emerged as the strongest positive influence on academic performance ($\beta = 0.490$, $p < .05$), followed by collegial leadership ($\beta = 0.285$, $p < .05$) and academic press ($\beta = 0.275$, $p < .05$), both of which also had positive and significant influence. In contrast, teacher professionalism showed a significant but negative influence on academic performance ($\beta = -0.383$, $p < .05$).

The positive influence of collegial leadership on students' academic performance suggests that supportive and participatory leadership practices by school principals enhance teaching effectiveness and learning outcomes. This finding aligns with prior studies which indicate that leadership characterized by collaboration, trust, and shared decision-making fosters a conducive learning environment and improves student achievement (Hoy & Miskel, 2013; Tschannen-Moran, 2014). Such leadership promotes teacher motivation and commitment, which indirectly translate into better academic outcomes for students.

Similarly, the significant positive effect of academic press indicates that schools that maintain high academic standards, clear expectations, and a strong focus on achievement tend to produce better-performing students. This finding corroborates earlier research demonstrating that academic press is a strong predictor of student success because it emphasizes discipline, goal orientation, and sustained academic engagement (Hoy, Hoy & Tarter, 2006). Schools that cultivate a serious academic atmosphere are more likely to encourage students to strive for excellence.

Community engagement also emerged as the strongest positive predictor ($\beta = 0.490$), indicating that effective collaboration between schools and their surrounding communities significantly enhances students' academic performance. This finding is consistent with the work of Epstein (2011), who emphasized that partnerships among schools, families, and communities create supportive learning environments that foster student success. Active parental involvement and community support contribute to improved student motivation, attendance, and academic achievement.

However, the negative relationship observed between teacher professionalism and students' academic performance is contrary to expectations and existing literature. Previous studies have consistently shown that teacher professionalism—manifested through collaboration, commitment, and adherence to professional standards—positively influences student outcomes (Darling-Hammond, 2000; Hattie, 2009). The negative coefficient in this study may suggest contextual or measurement-related issues, such as differences in how professionalism is perceived or practiced within the sampled schools. It may also reflect underlying challenges such as workload pressures, insufficient institutional support, or superficial collaboration that does not translate into improved instructional quality.

5. Conclusion

The study concluded that students' academic performance is influenced by organisational factors within the school system. A positive organisational climate reinforces collective efficacy, and high collective efficacy, in turn, sustains a healthy organisational climate. Strengthening these elements together offers a sustainable and effective pathway for improving teaching quality, student engagement, and academic performance in Lagos State senior secondary schools.

6. Recommendations

Based on the findings and conclusions of this study, the following recommendations are made to enhance organisational climate, and improve students' academic performance in Lagos State public senior secondary schools:

The Ministry of Education and relevant education boards should design and implement policies that promote collegiality, participatory leadership, and teacher collaboration in all public schools. These efforts are consistent with Organisational Climate Theory, which asserts that the internal atmosphere of an organisation determines employee performance and satisfaction.

Principals should adopt leadership styles that encourage open communication, trust, and shared decision-making. This approach will improve the overall school climate and enhance teachers' collective sense of purpose and ownership of student success.

Administrators should advocate for and ensure the equitable provision of teaching materials and infrastructure. A well-resourced environment reduces stress and allows teachers to focus on instructional quality, which positively affects both efficacy and performance.

Teachers should engage in collaborative goal-setting and evaluation of instructional outcomes. Working toward common objectives fosters stronger collective efficacy and a sense of shared responsibility for student achievement.

Teachers should take part in committees, workshops, and mentoring programmes that enhance professional relationships and strengthen the organisational climate.

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Influence of Secondary School Facilities Planning and Transformative Educational Management on the Utilization of Digital Tools in Bayelsa State, Nigeria

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Abstract. This study examined the influence of secondary school facilities planning and transformative educational management on the utilization of digital tools in public secondary schools in Bayelsa State, Nigeria. A correlational research design adopting an ex-post-facto approach was employed. The population comprised 3,699 teachers from 194 public secondary schools, from which a sample of 351 teachers was selected using the Krejcie and Morgan sampling technique. Data were collected using the School Facilities Planning and Utilization Questionnaire (SFPUQ), validated by experts in Educational Management and Measurement and Evaluation from Faculty of Education, University of Benin. A reliability coefficient of 0.85 was established using Cronbach Alpha. Descriptive statistics (mean and standard deviation) were used to answer research questions, while regression analysis tested the hypotheses at 0.05 level of significance. Findings revealed that instructional, circulation, and convenience spaces in secondary schools were planned to a low extent, and their utilization was equally low. However, significant relationships were established between facilities planning and utilization. Instructional space planning accounted for 38.3% of the variance in utilization, circulation space planning explained 41.1%, while convenience space planning exerted the strongest influence, accounting for 51.2% of the variance. The study concludes that inadequate planning of school facilities significantly undermines their effective utilization, including digital tools, in secondary schools. It recommends comprehensive, inclusive, and context-sensitive school facility planning, strengthened supervision, and integration of digital infrastructure to enhance effective utilization and educational outcomes in Bayelsa State.

Keywords: School Facility Planning, Instruction, Circulation and Convenience Spaces.

1. Introduction

Education is the important tool for social and technological change of any nation. The impact of quality education in the present-day society cannot be underscored as it is recognized as a critical factor for sustainable development. According to Madu and Kaegon (2018) education is seen as a catalyst that enables a nation to remain competitive in the global economy. Education equips the child with the required skills, knowledge, and attitude to function effectively in the society which makes it as an instrument par excellence for manpower development, and by extension, the development of the society. Secondary education contributes significantly in achieving this goal.

Secondary education is the education children acquire after primary school and before tertiary education (FRN, 2014). Secondary education in Nigeria is aimed at preparing and equipping individual for useful living within the society and for tertiary education. It is a suitable age for developing students' potentials. It is therefore critical to the education of a child. Thus, effective teaching and learning is crucial at this stage. This can only be achieved via adequate provision of well-planned and appropriate utilization of school facilities/plants. School facilities are synonymous with school plants, school infrastructures or school physical structures.

School facility has to do with all the materials and structures that expedite teaching and learning in the

school environment which include classrooms, laboratories, technical workshops, libraries, hostels, offices, water, visual and audio- visual aids, sporting facilities etc. School facility according to Adaja and Osagie (2015) consist of all the physical properties of a school which includes the ground, buildings and equipment located within the school. Wordu and Wehiuzo (2018) conceived that school facilities consist of the school land and all the physical structures on it such as the site, buildings, physical equipment, recreational spaces and books which promote the achievement of educational goals and objectives. Amanchukwu and Ololube (2015) maintained that school facilities is made up of machinery such as machines and tools used in the workshop, school site which comprise the landscape on which the school's permanent and non-permanent structures are built. The design and construction of the school facilities is usually determined by the school curriculum (Asiabaka, 2008). School plant therefore is the life wire of teaching and learning as well as other activities that are indirectly linked with the teaching-learning process within the school. To ensure the effectiveness of the school facility in the attainment of educational goals, they must be adequately planned.

The position of school facility planning in the development of effective/efficient secondary education cannot be under estimated. In order to have effective and efficient teaching and learning, school facilities should be seen as being closely interconnected and inter dependent. School facility planning is seen as the systematic and rational provision of educational facilities within the school system. National Open University of Nigeria (NOUN, 2021) posited that school plant planning involves construction of facilities/buildings that should sufficiently satisfy the present and future needs as well as promote favourable environment for effective teaching and learning. Iwerebor (2024) defined school facility planning as a systematic process that involves the development of educational programmes by choosing a suitable site, constructing relevant buildings using adequate resources to make teaching and learning efficient and effective for achievement of educational goals. School facility planning involves the planning of instructional space, administrative space, convenience space and circulation space. Kasali (2017) viewed educational facility planning as an all-inclusive process that begins with the identification of educational needs and ends in the completed buildings and facilities to house educational programmes. To Ajayi and Yusuf (2010) school plant planning is concerned with the choice of selecting a suitable site and instructional space, administrative space, circulation space and space of convenience which are designed to enhance the teaching and learning process in as school system. School facility planning has to be put in place for effective utilization of education facilities.

School facility planning which include instructional spaces planning (classroom, library, laboratory, workshops, art room, home economics laboratory, computer room, music room, multipurpose halls/rooms, acoustic comfort, assistive technologies, reliable power/charging etc.), administrative places planning (principal's office, staff room, guidance counselor's office, office assistants/clerk's office etc.), circulation spaces planning (corridors, lobby, ramps, staircases, recreational spaces), spaces for conveniences planning (toilets, cafeteria, kitchen, dormitories, custodian sheds, water sanitation and hygiene (WASH), sick bays, rest areas, water points, stores) and accessories planning (parks, fields, lawn, farms, courts etc.) are essential In teaching-learning process. The extent to which these spaces could enhance teaching and learning depends on their location within the school compound, their structure, and accessories. It is believed that a well-planned school plant in terms of location, structure and facilities will enhance expected outcomes of education that will facilitate good social, political and economic emancipation, effective teaching and learning process and academic performance of the students.

School facility planning should be inclusive to take care of persons with disabilities. Adetule and Ayodele (2019) identified inclusive planning as planning that take into cognizance disability as one of the essential elements while planning education with interest in the buildings, classrooms and curriculum structures. For effective and successful inclusivity in education, both the disabled and disability have to be thoroughly planned. School buildings should be planned in such a way for easy access for students with disabilities/disabled by making available access routes such as ramps, elevators, lifts, stairs,, bathrooms, toilets, entrances, doors, crossings, drinking facilities, detectable indicators for the blinds, fire safety, adaptive furniture, adaptive technology and resources such as text-to-speech software, speech-to-text software, and adaptive hardware etc. (Adetule & Ayodele, 2019).

Utilization of school facilities is crucial for effective teaching and learning activities in order for school goals and objectives to be achieved. Uguru and Abdullahi as cited in Morrison and Obata (2024) posited that when facilities are used optimally, they promote greater student interest in learning thereby enhancing their retention. Adequate resource provision according to Ugolo (2010) is a precursor to

effective utilization as there cannot be utilization without availability of resources. At times, these facilities may not be adequately utilized due to inadequate skills of the educators. According to Akinfolarin et al. (2012), overcrowding and overutilization of the facilities and spaces can bring about decline and breakdown of resources. Teaching and learning practices primarily are to bring about learners needed transformation in behavior through critical reasoning and this process does not take place in a vacuum but in an environment set aside to facilitate learning (Asiabaka, 2008). School facilities are space interpretation of the school curriculum (Amanchukwu & Ololube, 2015). Curriculum implementation will be hindered if the school physical facilities needed for teaching and learning are lacking. School facilities should be adequately maintained to give maximum service (Allen, 2015).

Studies have shown the influence of schools' facilities planning and its utilization which resulted to the attainment of school goals and objectives. Amongst these studies are those of Obasi (2019); Ibara (2018); Yusuf et.al. (2013) and Odufowakan (2011) who found out that facilities in secondary schools had high level of planning which they affirmed might be connected with thorough supervision, control, direction and monitoring by the inspectorate division of the Ministry of Education in charge of school facilities. Adetule and Ayodele (2019) in their study established that the level of utilization and maintenance of school plant planning determines students' academic performance and teachers' productivity in secondary schools. Ogolo (2010) observed inadequacies in physical and teaching resources among secondary schools in Bayelsa State. Morrison and Obata (2024) discovered a significant difference in the utilization of school facilities among various colleges of education in Delta State.

Bayelsa State which has eight local government areas lies within the rainforest zone, with a humid equatorial climate and mean annual rainfall ranging from 2,000 to 4,000. The maximum temperature averages 30^0C with a relative humidity between 55 and 90 percent, depending on season and location. Bayelsa State is drained by the tributaries of the Niger/Benue rivers system empting into the Atlantic Ocean. The state is mostly surrounded by water or wetland. The state has 194 public secondary schools. The nature of the land calls for adequate well-planned school facilities in terms of structures for inclusivity in education for the populace. It's against this back drop that the study seeks to investigate the influence of secondary school facilities planning and transformative educational management on the utilization of digital tools with focus on instructional, circulation and convenience spaces.

1.1 Statement of the Problem

Instructional, circulation and convenience spaces consist of the basic system and structure needed in schools so as to function effectively and efficiently for the maximal actualization of the goals and objectives of inclusive secondary schools. However, when these spaces are not well planned, this may hamper effective utilization and delivery of education. Bayelsa State been in a riverine area is often affected by flooding, planning and utilization of the secondary school facilities becomes imperative to enhance teaching and learning. Could it be that school facilities wrongly sited and lacks basic features that hinders inclusivity hence, resulting to inadequate utilization of the facilities? It is on this premise the study sought to find out the influence of facilities planning and it's utilization in secondary schools in Bayelsa State.

1.2 Purpose of the Study

The purpose of the study is to determine the extent of instructional, circulation and convenience spaces planning in secondary schools in Bayelsa State, their utilization and relationship between their planning and utilization.

1.3 Research Questions

The following research questions guided the study:

- To what extent are instructional, circulation and convenience spaces planned in secondary schools?
- What is the level of school facilities utilization among secondary schools in Bayela?
- Is there a significant relationship between instructional space planning and their level of utilization in secondary schools?
- Is there a significant influence between circulation space planning and their utilization level in secondary schools?
- Is there a significant influence between convenience space planning and their level of utilization in secondary schools?

1.4 Hypotheses

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

- There is no significant relationship between instructional space planning and their utilization in secondary schools.
- There is no significant influence between circulation space planning and their utilization in secondary schools.
- There is no significant influence between convenience space planning and their utilization in secondary schools.

2. Research Methodology

The study is a correlational and employed the ex-post-facto design. The population of the study comprised three thousand, six hundred and ninety- nine (3,699) teachers from one hundred and ninety- four (194) public secondary schools in Bayelsa State. The Krejcie and Morgan sampling table was used to randomly select three hundred and fifty-one (351) teachers as sample for the study from some primary schools in Bayelsa State. The instrument titled "School Facilities Planning and Utilization Questionnaire (SFPUQ)" was used to elicit data for the study. The questionnaire is divided into two sections: Section A is a 4 Likert scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD) having 15 items addressing school facilities planning and Section B addressed level of facilities utilization with responses of Highly Utilized (HU), Moderately Utilized (MU),, Rarely Utilized (RU) and Not Utilized (NU with 15 items all segmented into their parts A, B and C. The instrument was validated by two experts in Departments of Educational Management and Measurement & Evaluation in the Faculty of Education, University of Benin. The questionnaire was administered to 20 teachers who were not part of the sample and Cronbach Alpha was used to test for the reliability, establishing a co-efficient of 0.85. A descriptive statistic of mean and standard deviation was used to answer the research questions while Pearson Product Moment Co-efficient was used to test the hypothesis. A mean score below 2.00 was regarded as very low extent, 2.00- 2.40 as low extent and above 2.50- 2.90 as moderately high extent, 3.0- 3.40 as high extent and above 3.50 as very high extent.

3. Results

Research Question One: To what extent are instructional, circulation and convenience spaces planned in secondary schools?

Table 1: The Extent to Which Instructional, Circulation and Convenience Spaces are Planned in Secondary Schools

Items of spaces planning	Mean	Standard deviation	Remark
Instructional spaces planning	2.21	1.00	Low
Circulation spaces planning	2.49	0.99	Low
Convenience space	2.21	1.09	Low
Grand mean	2.30	1.04	

Table 1 presents respondents' views on how well instructional, circulation, and convenience spaces are planned in secondary schools. The results show that instructional space planning, circulation space planning, and convenience space planning all fall within the low range, as indicated by their mean ratings. The grand mean of 2.30 implies that the extent of space planning in secondary schools was to a low degree.

Research Question Two: What is the level of school facilities utilization among secondary schools in Bayelsa?

Table 2: The Level of School Facilities Utilization among Secondary Schools in Bayelsa

School facilities utilization	Mean	Standard deviation	Remark
Instructional spaces planning	2.09	0.96	Low
Circulation spaces planning	2.43	1.04	Low
Convenience space	2.19	1.11	Low
Grand mean	2.24	1.04	

Table 2 indicates that utilization of instructional spaces, circulation spaces, and convenience spaces is low, with mean scores of 2.09, 2.43, and 2.19, respectively. The grand mean of 2.24 further confirms that the level of school facilities underutilization among Secondary Schools in Bayelsa was low. This suggests that even where facilities exist, they may not be adequately used for teaching, movement, or convenience purposes.

Hypothesis Testing

Hypothesis One: There is no significant relationship between instructional space planning and their utilization in secondary schools.

Table 3: Regression Analysis of the relationship between Instructional Space Planning and their Utilization in Secondary Schools

Model	Sum of Squares	Df	Mean Square	F	Sig.	Remark
Regression	9460.808	1	9460.808	155.245	.000	Significant
Residual	15113.388	248	60.941			
Total	24574.196	249				

R = 0.620; Adjusted R Square = 0.383

Table 3 reports an F-value of 155.245 with a p-value of 0.000. Testing at an alpha level of significance, the p-value is less than the alpha. Therefore, the null hypothesis is rejected. This implies that a statistically significant relationship exists between instructional space planning and utilization at the 0.05 level. The Adjusted R^2 of 0.383 shows that instructional space planning accounts for about 38.3% of the variance in facility utilization. This means that better planning of instructional spaces is strongly associated with improved utilization of school facilities.

Hypothesis Two: There is no significant influence between circulation space planning and their utilization in secondary schools.

Table 4: Regression Analysis of the relationship between Circulation Space Planning and their Utilization in Secondary Schools

Model	Sum of Squares	Df	Mean Square	F	Sig.	Remark
Regression	10168.447	1	10168.447	175.053	.000	Significant
Residual	14405.749	248	58.088			
Total	24574.196	249				

R = 0.643; Adjusted R Square = 0.411

Table 4 reveals an F-value of 175.053 and a p-value of .000. Testing at an alpha level of significance, the p-value is less than the alpha. Therefore, the null hypothesis is rejected. This implies that a circulation space planning significantly influences facility utilization. The Adjusted $R^2 = 0.411$, circulation space planning explains 41.1% of the variance in utilization. This indicates that properly planned movement areas contribute greatly to how effectively school facilities are used.

Hypothesis Three: There is no significant influence between convenience space planning and their utilization in secondary schools.

Table 5: Regression Analysis of the relationship between Convenience Space Planning and Its Utilization in Secondary Schools

Model	Sum of Squares	Df	Mean Square	F	Sig.	Remark
Regression	12621.741	1	12621.741	261.887	.000	Significant
Residual	11952.455	248	48.195			
Total	24574.196	249				

R = 0.717; Adjusted R Square = 0.512

Table 5 shows an F-value of 261.887 with a p-value of .000. Testing at an alpha level of significance, the p-value is less than the alpha. Therefore, the null hypothesis is rejected. This implies that convenience space planning significantly influences facility utilization. The Adjusted R^2 of 0.512 indicates that convenience space planning explains 51.2% of the variation in facility utilization, suggesting that planning of convenience spaces is a major determinant of overall facility use.

4. Discussion of findings

The study revealed that instructional, circulation, and convenience spaces are poorly planned in secondary schools in Bayelsa State. These findings contradict the expectations described by Adaja and Osagie (2015) and Wordu and Wehiuzo (2018) who emphasized that school facilities should include properly planned buildings, classrooms, and equipment that enhance teaching and learning. The low planning level also negates Asiabaka's (2008) position that the design and construction of school facilities must be guided by the curriculum to ensure a smooth teaching-learning process. Poor planning reduces the effectiveness of the

school environment as a "life wire" of instruction, as described by Amanchukwu and Ololube (2015). Being that Bayelsa is situated in a flood-prone terrain, lack of thoughtful planning suggests that schools are not taking environmental conditions, accessibility, and safety needs into consideration, despite recommendations for inclusive planning by Adetule and Ayodele (2019), who stressed ramps, assistive technologies, and accessible facilities for learners with disabilities. Thus, the poor planning of functional spaces hampers teaching, learning, inclusivity, and school resilience.

The low utilization of facilities supports Uguru & Abdullahi as cited in Morrison & Obata, (2024) who explained that facilities must be actively and efficiently used to improve students' interest, motivation, and retention. Underutilization indicates that existing facilities however fewer or inadequate, are not maximally deployed for instructional and administrative purposes. This is in line with Ogolo (2010) observation that inadequacies exist in physical and teaching resources among secondary schools in Bayelsa State It equally aligns with Akinfolarin et al. (2012) who reported that underutilization often occurs alongside inadequate teacher skills, overcrowding or poorly planned structures. The result contradicts those of Obasi, (2019); Yusuf et. al. (2013) who found high levels of facility planning and usage in some states due to strong inspectorate oversight. Such supervision appears weak or inconsistent in Bayelsa, contributing to ineffective utilization.

This finding shows that better-planned instructional spaces such as classrooms, libraries, laboratories, workshops, ICT rooms—directly influence how well teachers and students use them. Instructional facilities that are accessible, functional, and aligned with curricular demands encourage effective learning, consistent with Asiabaka (2008) and Amanchukwu and Ololube (2015). The strong predictive power (38.3%) confirms that schools cannot achieve optimal digital tool utilization without adequate instructional planning. This supports Adetule and Ayodele (2019) whose findings showed that planning and maintenance of school plants determine academic productivity. Thus, instructional spaces must be well-structured before digital tool integration can succeed.

Circulation spaces e.g. corridors, ramps, stairs, lobbies, walkways, recreation fields—affect how individuals move and use facilities. Poorly designed movement spaces impede access, reduce safety, and discourage facility usage. The moderate effect (41.1%) supports the view of NOUN (2021) and Ajayi and Yusuf (2010) that circulation spaces are key elements of school plant planning needed for smooth and safe operational flow of schooling activities. It also connects with Adetule and Ayodele (2019) who emphasized accessibility for learners with disabilities. Where circulation spaces are poorly planned, students with physical challenges struggle to access instructional areas, thus lowering utilization.

Convenience spaces like water points, toilets, cafeterias, rest areas, sanitation/WASH points exert the strongest influence on facility utilization (51.2%). Schools with adequate convenience facilities ensure safety, comfort, and hygiene, which enhances attendance and participation. This finding reflects Allen (2015) who argued that well-maintained facilities support optimal service delivery. Also, the positive influence aligns with Iwerebor (2024) who stressed that the planning of spaces such as conveniences improves efficiency and the achievement of educational goals. Conversely, absence of such spaces reduces digital tool usage, mobility, teacher comfort, and instructional productivity.

5. Conclusion

The study concludes that secondary school facility planning in Bayelsa State across instructional, circulation, and convenience spaces are generally inadequate. This poor planning directly contributes to low utilization of facilities, including digital tools. The strongest determinant of facility utilization is convenience space planning, followed by circulation and instructional space planning. This indicates that effective infrastructure planning significantly enhances school operations, teaching quality, inclusivity, and curriculum implementation.

6. Recommendations

Government and school administrators should prioritize comprehensive school facility planning. Facilities must follow curriculum needs, environmental realities, and inclusive standards as recommended by Asiabaka (2008) and Adetule and Ayodele (2019). Digital tools should be integrated into facility planning to ensure reliable power, security, and accessibility.

Teacher capacity building should be emphasized to address skill-related underutilization, in line with Akinfolarin et al. (2012). Regular monitoring and supervision by inspectorate divisions should be strengthened, similar to the situation noted by Obasi (2019) and Yusuf et al. (2013).

Instructional spaces should be redesigned or upgraded to meet modern teaching requirements and digital integration.
Circulation spaces should be restructured for accessibility, safety and smooth navigation to improve facility usage.
Convenience spaces should be expanded and improved, especially WASH facilities, toilets and rest points, since they have the strongest impact on facility utilization.

7. Implications for Educational Managers, Policy Makers and Curriculum Implementers

School heads must adopt a data-driven facility planning model inspired by curriculum demands (Asiabaka, 2008). They must ensure accessibility and inclusivity (Adetule & Ayodele, 2019). Poor planning leads to inefficiency, underutilization, and reduced staff productivity (Adetule & Ayodele, 2019).

There should be policies put in place to mandate minimum planning standards for instructional, circulation and convenience spaces. Investment guidelines should be aligned with environmental needs in flood-prone areas. Policy frameworks must enforce periodic facility audits similar to inspectorate activities highlighted by Obasi (2019).

Curricula requiring digital literacy, lab work, or collaborative learning cannot be effectively implemented without well-planned spaces (Amanchukwu & Ololube, 2015). Poor facilities impede the experiential learning approach emphasized in Nigerian secondary education. Curriculum implementation teams must advocate for physical environments that match instructional goals.

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Comparative Effectiveness of Non-Formal Education Strategies in Reducing Social Vices among Nigerian Adolescents: Jingle, Movie and Crusade Initiatives

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Abstract. Social vices and restiveness among adolescents pose increasing risks to national security and social stability in Nigeria. non-formal educational strategies, which include the use of jingles, films, and crusades, represent possible behavioural strategies against social vices. However, there is no comparative assessment of the effectiveness of such programmes, especially considering the influence of gender and geographical locations on their efficacy. Therefore, this study aims to compare the effectiveness of jingle, film, and crusade programmes in preventing social vices among adolescents in Nigeria while accounting for the moderating effects of gender and geopolitical locations. The research adopted a mixed methods approach and used a pre-test-post-test quasi-experiment. A sample size of 1,200 adolescents (67% males and 33% females) who had dropped out of school was drawn from all six geopolitical regions of Nigeria. The participants were assigned nonrandomly to three different treatment groups based on the type of intervention: jingles, movies, and crusades. The data was analyzed using descriptive statistics, paired samples t-test, one-way analysis of variance (ANOVA), analysis of covariance (ANCOVA) (α= 0.05), post hoc (Bonferroni) corrections, and partial η^2. The most common economic survival activities were casual labour (73.9%), vocational skills development (65.9%), and street vending (52.0%). The major perceived cause of youth restiveness were corruption (77.0%), failure of economic policies (76.0%) and poverty (72.0%). The three non-formal education programmes resulted in the significant decrease of social vices in the sample, with the largest effect seen in vices reduction ($F(2,1197)=14,451.93$, $p<0.001$, $\eta^2=0.969$). The jingles intervention had the highest mean post-intervention scores compared to movies and crusades in all categories tested: survival activities (M=74.82), restiveness reduction (M=83.48) and vices curbing (M=64.75). Significant differences were found between all groups ($p<0.001$). The moderating effect of gender was detected on the variable restiveness reduction ($F=4.20$, $p=0.041$), but not on survival activities or vices reduction. Geopolitical location was another moderator for vices reduction ($F=4.03$, $p=0.001$); the biggest reduction was noted for North Central. It can be concluded that non-formal education strategies, especially jingles, are effective in preventing social vices. However, gender and geographical location were moderators of specific variables. Therefore, targeted approaches are recommended. For policymakers, it means investing in NFES programmes (mainly jingles), establishing centers for skill development, anti-corruption measures, etc.

Keywords: Non-formal education; adolescent social vices; jingles; Nigeria; quasi- experimental; restiveness

1. Introduction

As a result of the rise of adolescent social vices and unrest, restiveness has become a global problem affecting public health and security. Nigeria, which has a large youthful population of over 200 million people, faces a critical case of adolescent social vices and restiveness that can be described by Igbo and Ikpa (2013) as "a serious danger to security". This has been aggravated by corruption, high youth unemployment rate above 42%, widespread poverty (exceeding 40%) and ineffective governance institutions. This combination has fuelled various vices committed by

the young people, including banditry, terrorism, ritual killings, human trafficking, prostitution, abuse of hard substances, cultism, online scam (Yahoo Yahoo) and kidnapping for ransom. Interestingly, the greatest number of participants in these acts belong to the youthful age group between 15 and 24 years (Igbo & Ikpa, 2013), at an age when they ought to be in their most productive years. They are unemployed or under-employed, thus channelling all their frustration into these unproductive ventures.

Social vices of adolescents refer to activities that breach societal standards and are sometimes against the law. Some of them include substance abuse and street vending among the less serious ones, whereas armed robbery, cultism, kidnapping are examples of grave criminal activities. On the other hand, restiveness involves agitation and defiance of authority or the law. It might be manifested by demonstrations and violent confrontations between protesters and police. Although it is natural to exhibit risky behaviours, the magnitude of the problems facing the country requires analysis of deeper causes.

With a view to addressing youth vices and restiveness, it is imperative to test various mitigation strategies. As suggested, the effectiveness of non-formal education strategies should be evaluated. Non-formal education refers to any educational activity organised outside of the formal school system that targets particular individuals with certain learning requirements (Abo-Seriah, 2020). Such strategies possess numerous advantages in comparison to the regular schooling system because they are flexible, cheap, more relevant to daily experience and delivered via mass media and other channels of outreach. Communication-oriented non-formal strategies include films, jingles (audio messages with a song-like melody or rhythm), crusade campaigns and public rallies and forums. However, it is uncertain which method of education yields the best results and should be used in mitigating youth problems. To clarify this question, there is a need to conduct research.

The study would rely on a set of complementary theoretical concepts. In accordance with Social Learning Theory, a person acquires certain behaviour patterns by observing others (Bandura, 1977). Movies and crusades, for example, might serve as sources of behavioural models (positive ones in case of good examples of youth free of drug abuse or criminal activities or negative ones representing harmful behaviour of those who suffer from its consequences). Another mechanism of social learning that might apply to the jingle technique is mere exposure and association, i.e., repeated listening to the same tunes evokes positive feelings associated with the message content. Another useful theory for analysing non-formal education strategies is the Health Belief Model. According to this model, the main determinants of behaviour change include perceived susceptibility, severity, benefits and barriers (Rosenstock, 1974). Perceived susceptibility represents the idea that there is an actual danger of something occurring, whereas perceived severity refers to the perception that an illness or other threat will have terrible consequences. The third determinant concerns the belief that the prescribed course of action will bring beneficial results in reducing vulnerability to risks. Finally, perceived barriers represent beliefs that potential costs or obstacles of taking the recommended action outweigh the benefits. Non-formal education aimed at eliminating social vices must make youths more susceptible to the risk of engaging in them and feeling the fear that it leads to death or imprisonment. Furthermore, it is necessary to reduce perceived barriers to alternative actions (such as attending vocational schools and getting employment). In this context, it is possible to hypothesise that variables of gender and geographical location might influence the process of information acquisition and retention.

There are various articles related to youth vices, restiveness and related topics in Nigeria. Several authors point out the reasons for youth unrest, such as lack of parental supervision (Oladele et al., 2018), poverty and economic exclusion (Agbaji et al., 2018), peer pressure (Adebiyi et al., 2019), unemployment (Bello, 2018), allure of "quick money" through internet fraud (Apuke & Dogari, 2017) and other societal pressures including consumerist culture and media influence (Uzoamaka & Nwagbala, 2023). Estimates of prevalence of vices differ dramatically across studies depending on the method of sampling, geographic setting and type of data collection. For instance, sampling techniques involve out-of-school or in-school youths or the total youthful population, geographical setting includes one or multiple states, self-reports, interviews or statistical data. Most importantly, studies concentrating on in-school adolescents ignore the biggest portion of youth population that lacks any schooling. This article focuses on out-of-school adolescents living in all six geopolitical zones of Nigeria.

Deficiencies inherent in the formal education system have led to the marginalisation of adolescents. These deficiencies include underfunding, poor infrastructure, lack of teachers, strikes at secondary school and university levels, and a curriculum mismatched with the labour market requirements, among others, leading to vulnerability to social vices. The informal education

sector in Nigeria has a huge problem of out-of-school population of about 10 million children and adolescents making it difficult for the country to have some of the highest out-of-school child populations in the world (UNESCO, 2022). Adolescents that find themselves without access to formal education due to dropping out, expulsion, or not enrolling in schools can access alternative learning routes in terms of acquiring life skills and vocational abilities in addition to socialisation in prosocial attitudes through non-formal educational strategies. However, studies have not addressed the moderating roles of gender and geographical location in the effectiveness of NFES on adolescents' social vices. This information is needed since interventions based on a one-size-fits-all strategy cannot help adolescents' different situations in Nigeria.

First, gender should be considered as a moderator of the effectiveness of interventions because of different reasons. First, socialisation process differs depending on gender in Nigeria where males experience more freedom of movement compared to females, although males are expected to perform better financially; females are supervised more closely compared to males, even though they may have limited freedom (Uzoamaka & Nwagbala, 2023). Second, there are differences in the types of social vices committed by males and females where males commit many acts of crime, cultism, and robbery while females are mostly engaged in prostitution, stealing, and aiding males' criminal behaviour (Omeje et al., 2020). Third, receptiveness of intervention strategies could be different depending on the gender, for instance, males seem to respond better to audio visual strategies than females (Ponam et al., 2023). For instance, according to Ponam et al., (2023) violent movies influenced male students' aggression compared to female students, thus, supporting a differential effect of media-based interventions. However, no study has examined whether NFES strategies such as jingles, movies, and crusades are effective differently depending on gender for survival activities, restiveness, and social vices prevention. This finding aligns with the work of Salawu, et al (2024), who specifically explored gender differences in the effectiveness of jingle, movie, and crusade strategies on adolescent restiveness in Nigeria, noting that males and females responded differently to the same non-formal education interventions.

In addition, geographical location is another factor that could influence intervention effectiveness. Geographical locations differ in terms of infrastructure such as electricity supply (important for movie projection and radio broadcast), telecommunications, roads, and places for community gatherings. Different zones have different cultural beliefs and social vices as well as differences in the religious composition of communities. For instance, kidnap for ransom cases are common in the SouthEast and SouthSouth Zones, Boko Haram insurgency has occurred mainly in the NorthEast Zone, and Banditry is most likely to happen in the Northwest Zone of Nigeria. A single strategy cannot provide equal effectiveness in all these zones. Nonetheless, most previous studies have focused only on one geographical location or just described location without analysing it statistically. Therefore, this study would examine whether each strategy is effective to different degrees depending on adolescents' location.

There are some findings from the literature on non-formal educational strategies that show promising results although they have limitations. In the case of jingles in Anambra State, Okonkwo et al. (2019) found that radio and television helped to increase awareness among adolescents about drug abuse risks. Although their study included a large sample size and used radio and television, it was conducted in only one state without comparing the jingles to other forms of interventions and measured only awareness but not behaviour. According to Chatterji et al. (2020) mass media campaigns in different African countries including Nigeria that have included both radio and television were most effective in changing adolescents' behaviour, although very few studies have made comparisons between mass media strategies. Ibrahim et al. (2020) examined the effect of religious crusade in Kano State for three months and found that the strategy has changed positively the intention to stay away from drugs, although its effects declined after three months and non-Muslim students were excluded.

Based on a synthesis of the literature, this study would attempt to fill four main gaps in the literature. First, there is no comparative effectiveness trial in which different forms of non-formal education strategies (such as jingle, movie, and crusade) are directly compared within the same experiment, using comparable outcome measures, dosing, and statistical controls. Without this kind of information, stakeholders have no scientific basis for choosing how to distribute the available resources among competing modes of intervention. Second, gender has not been adequately studied as a potential moderator of the intervention effect. Existing studies ignored female participants or only analyzed data for males or simply did not test for interaction. Given the different social role and different exposure risk as well as help-seeking behaviour of men and women, this is an important omission. Third, there is no study that considered geographical location of participants as a possible

moderator. Fourth, most existing works are purely quantitative; thus, there is little data on adolescents' views on different non-formal education strategies, which could be very useful for developing recommendations for future interventions.

With this in mind, one can see the place and importance of the present study within the current state of the literature. The independent variables in this study include different types of non-formal education strategy that is being used, and they affect several dependent variables. These dependent variables are: adolescents' legitimate economic activities, specifically casual labour and street trading, distinct from vice-related activities (as the first); adolescents' restiveness, agitated and rebellious behaviour, in particular (as the second); and finally, social vices curbing, meaning reduction in vice-related behaviours such as substance abuse (as the third). Gender and geopolitical location, six zones, are the moderating variables that might change the relationships between independent and dependent variables. A mixed methods design, which incorporated a survey with the pretest/posttest approach was chosen. Covariates were age, religion, and ethnicity.

1.1 Objectives of the Study

The major goal of this research was to investigate how well three non-formal educational approaches namely, jingle, movie, and crusade could mitigate the social vices among Nigerian youth and which one is more effective based on gender and geopolitics. The research would seek to answer the following questions:

- What are the common survival activities, causes of restiveness, and social vices that abound in Nigerian youth?
- How effective is the use of jingle, film, and crusade individually in reducing the survival activities, restiveness, and social vices of Nigerian youth?
- Which of the three methods is the most effective in reducing the survival activities, restiveness, and social vices of Nigerian youth?
- Is there a significant difference in the effectiveness of any of the methods between male and female youth in the three areas?
- Is there a significant difference in the effectiveness of any of the methods between Northern, South East, and South West geopolitical zones in the three areas?

1.2 Research Questions

The study was carried out based on the following research questions:

- What are the predominant survival activities, sources of restiveness, and social vices among Nigerian adolescents?
- What is the feedback provided by Nigerian adolescents on their experiences under the different initiatives (jingles, movies, or crusades)?

1.3 Hypotheses

The hypotheses were tested using $\alpha = 0.05$ significance level.

(i) There is no significant effect of jingles, movies, and crusades on adolescents' survival activities, restiveness, or social vices.
(ii) There is no significant difference in the effects of jingles, movies, and crusades in alleviating adolescents' survival activities, restiveness, or social vices.
(iii) There is no significant gender difference in the effects of jingles, movies, and crusades on:

(a) Adolescents' survival activities.
(b) Adolescents' restiveness.
(c) Adolescents' social vices.

(iv) There is no significant difference in the effects of jingles, movies, and crusades depending on adolescents' geopolitical location for:
(a) Adolescents' survival activities.
(b) Adolescents' restiveness.
(c) Adolescents' social vices.

2. Research Methodology

In this research, researchers adopted a mixed methods convergent research design (Creswell & Plano Clark, 2017), where survey data was combined with a quasi-experiment study design. This experiment used a three-group non-equivalent pretest-posttest design. That is, the first group (Jingle) was subjected to pretest (O_1), jingle treatment (X_1) and posttest (O_2). Similarly, the second group (Movie) experienced pretest (O_3), movie treatment (X_2) and posttest (O_4), while the third group (Crusade) was subjected to pretest (O_5), crusade treatment (X_3) and posttest (O_6). Moderation effects were estimated using factorial ANOVA, considering treatment, gender and geopolitical zone as factors. Since there is no random allocation to any of the 36

combinations of the factors, this is not a factorial experiment but moderation analysis.

The target population consisted of out-of-school adolescents located in Nigeria's 36 states and Federal Capital Territory (Abuja). Participants were recruited through convenience sampling at a drug awareness seminar organised by the National Drug Law Enforcement Agency (NDLEA), and then continued using snowball sampling techniques, to recruit 200 participants from each geopolitical zone (N = 1,200). Limitation: recruiting from NDLEA event might lead to an overrepresentation of adolescents who are worried about drug abuse or previously interacted with the NDLEA officers. Power Analysis: Conducted in G*Power (Faul et al., 2009) for ANCOVA with three groups, medium effect size (f = 0.25), α = 0.05, power = 0.80 resulted in the minimum required sample N = 399; hence, this sample size had enough statistical power.

Participants were recruited during an international day against drug abuse and illicit trafficking, organized by the National Drug Law Enforcement Agency (NDLEA). Limitation: recruiting participants from antidrug awareness day may cause selection bias because adolescents who attend such events can differ from those who do not attend. Therefore, results should be generalized with some caution. Criteria for inclusion: (a) age between 15 and 24 years; (b) not currently studying in secondary or postsecondary institutions; (c) resided in Nigeria for more than 12 months; (d) written consent from participant and parents for adolescents ages 15 to 17. Criteria for exclusion: (a) Currently enrolled in formal education institution; (b) Cognitive impairments that affect questionnaire completion. Demographics: 67.0% male, 33.0% female; 47.0% Christians, 41.0% Muslims, 12.0% Traditional/other; The sample reflected the majority ethnic group in each geopolitical zone (e.g., Hausa in North West, Igbo in South East, Yoruba in South West). Minorities were not included and hence generalization is limited. Each geopolitical zone had 200 participants (16.7%).

2.1 Instrumentation

The authors devised the ASVNQ questionnaire which consisted of seven parts: demographics; survival activities (α = 0.85); causes of restiveness (α = 0.83); vices manifestations (α = 0.79); present solution effectiveness (α = 0.81); implementation difficulties (α = 0.68; caveat required); and potential solutions (α = 0.78). Content validity appeared satisfactory (S-CVI = 0.87); however, construct validity using factor analysis did not feature. In developing the ASVNQ instrument, the authors drew upon previous work by Ojo, et al (2023), who examined the effect of educational resources on teaching and learning in Nigerian universities, adapting their approach to item construction for non-formal education contexts. In total, three interventions have been tested in the course of research: an audio jingle (3 min) about drug dangers; a Nollywood movie (25 min) on the topic of cults; and a religious crusade (45 min) for spiritual revival. There have been significant differences between interventions regarding modality, duration (see above), and religion (only one intervention had a distinctively religious element). Therefore, it becomes rather difficult to make a proper distinction in terms of these variables.

Ethical clearance was provided by the National Open University of Nigeria, having received permission from the NDLEA. Written consent was acquired from the respondents after being assured that their participation was purely optional. Questionnaires were distributed within eight weeks of data collection through the use of six research assistants (k = 0.87 inter-rater reliability). In addition, pre-test took place in weeks 2–3, three intervention sessions (jingle/film/crusade) in weeks 4–6, a post-test in week 7, and qualitative interview in week 8 among 180 participants. Questionnaires were returned at 100%, although there is a possibility of the presence of social desirability bias.

Statistics involved calculating descriptive parameters, performing a paired samples t-test, and conducting ANCOVA test (homogeneity of regression slopes proved satisfactory, p = 0.29) and factorial ANOVA analysis in order to investigate moderation effects. All necessary assumptions were satisfied (normality, homogeneity of variance, no sphericity required). Qualitative analysis entailed applying Braun and Clarke's coding (2006) framework, achieving k = 0.84.

3. Data Analysis and Results

Research Question 1: What are the most prevalent survival activities, causes of restiveness, and social vices among Nigerian adolescents?

Table 1: Descriptive Statistics of Adolescent Survival Activities

Activity	% Often/Very Often	Mean	SD	Interpretation
Casual labour	73.9%	3.08	0.95	Often
Vocational training workshops	65.9%	2.94	0.99	Often
Alcoholism	57.0%	2.72	1.09	Often
Smoking	55.0%	2.67	0.97	Often
Under-paid job	55.0%	2.50	1.11	Often
Small scale farming	54.0%	2.72	1.13	Often
Street trading (hawking)	52.0%	2.64	1.11	Often
Relying on family financial assistance	51.0%	2.56	1.05	Often
Internet fraud	17.0%	1.85	0.95	Rarely
Drug trafficking	14.0%	1.75	0.95	Rarely
Kidnapping	14.0%	1.68	0.95	Rarely

Note: Mean interpretation: 1.00–2.49 = Rarely; 2.50–4.00 = Often.

In terms of Research Question 1 on the predominant social vices and survival tactics practiced by Nigerian adolescents, the survival tactics are stated in Table 1 above. The most common strategies include casual labour (73.9% with a mean of 3.08 and an SD of 0.95), vocational training workshop participation (65.9% with a mean of 2.94 and an SD of 0.99), alcoholism (57.0% with a mean of 2.72 and an SD of 1.09), and smoking (55.0% with a mean of 2.67 and an SD of 0.97).

Table 2: Major Causes of Adolescents' Restiveness

Cause	% Agree/Strongly Agree	Mean	SD
Corruption	77.0%	3.21	0.97
Restiveness as "way out" of poverty	76.0%	3.14	0.96
Poor economic policy	76.0%	3.12	0.93
Poverty	72.0%	3.12	1.07
Lack of requisite education/skills	69.0%	2.93	1.01
Bad governance	68.0%	3.04	1.06
High unemployment	68.0%	3.00	1.08
Lack of viable income opportunities	68.0%	3.01	1.01

In relation to the causes of adolescents' restiveness (Table 2), the results reveal that the top causes of restiveness cited by the adolescents include: corruption (77.0%, M=3.21, SD=0.97); restiveness as "way out" of poverty (76.0%, M=3.14, SD=0.96); poor economic policies (76.0%, M=3.12, SD=0.93); and poverty (72.0%, M=3.12, SD=1.07).

Hypothesis Testing for H_{01}: Jingles, movies, and crusades have no significant influence on the adolescents' survival activities, restiveness, and vices

Table 3: ANCOVA Summary for Main Effects of Treatments

Dependent Variable	Source	SS	df	MS	F	p	η^2	Decision
Post-Survival Activities	Treatment	15834.2	2	7917.1	12064.52	<0.001	0.963	Reject H_{01}, H_{02}
	Error	785.3	1197	0.656				
Post-Restiveness Reduction	Treatment	8562.1	2	4281.1	7494.10	<0.001	0.942	Reject H_{01}, H_{02}
	Error	683.9	1197	0.571				
Post-Vices Curbing	Treatment	18924.5	2	9462.3	14451.93	<0.001	0.969	Reject H_{01}, H_{02}
	Error	783.2	1197	0.654				

Note: All models controlled for pretest scores as covariates. Critical $F(2,1197) = 3.00$ at $\alpha = 0.05$.

In regard to H01 (that jingles, films, and crusades do not influence social vices), and H02 (that there is no differential effectiveness of the three approaches), the ANCOVA analysis of the main effect of treatment on the dependent variables is summarized in Table 3. It is evident that the three treatments have shown significant main effects for each of the dependent variables. In terms of adolescents' survival activities, $F(2, 1197) = 12{,}064.52$, $p < 0.001$, partial $\eta^2 = 0.963$. In terms of adolescents' decreased restiveness, $F(2, 1197) = 7{,}494.10$, $p < 0.001$, partial $\eta^2 = 0.942$. In terms of controlling social vices, $F(2, 1197) = 14{,}451.93$, $p < 0.001$, partial $\eta^2 = 0.9$

Table 4: Estimated Marginal Means (Post-Test) by Treatment Condition

Dependent Variable	Jingle (n=400) M (SE)	Movies (n=400) M (SE)	Crusade (n=400) M (SE)	Order
Post-Survival Activities	74.82 (0.04)	54.98 (0.04)	34.25 (0.04)	Jingle > Movies > Crusade
Post-Restiveness Reduction	83.48 (0.04)	64.35 (0.04)	44.70 (0.04)	Jingle > Movies > Crusade
Post-Vices Curbing	64.75 (0.04)	55.00 (0.04)	24.67 (0.04)	Jingle > Movies > Crusade

The results of the estimated marginal means (posttest) according to the pretests are provided in Table 4 for each treatment group. Estimated marginal means (posttest) for postsurvival activities were the following: Jingle M = 74.82, SE = 0.04; Movies M = 54.98, SE = 0.04; Crusade M = 34.25, SE = 0.04. For postrestiveness reduction, means included: Jingle M = 83.48, SE = 0.04; Movies M = 64.35, SE = 0.04; Crusade M = 44.70, SE = 0.04. Post vices curbing mean was the following: Jingle M = 64.75, SE = 0.04; Movies M = 55.00, SE = 0.04; Crusade M = 24.67, SE = 0.04. According to the Bonferroni post hoc analysis, all differences between pairs were statistically significant ($p < 0.001$).

Moderating Effect of Gender

Table 5: Gender Moderation Effects (Factorial ANOVA)

Hypothesis Component	Dependent Variable	F (gender main effect)	df	p	η^2	Decision
$H_{03}a$	Adolescents' survival activities	0.02	1, 1196	0.904	<0.001	Not rejected
$H_{03}b$	Adolescents' restiveness	4.20	1, 1196	0.041	0.004	Rejected
$H_{03}c$	Social vices curbing	0.96	1, 1196	0.328	0.001	Not rejected

On the other hand, with respect to H_03 (there are no gender differences in the effectiveness), Table 5 contains information concerning gender moderation effects from factorial ANOVA. Gender failed to exert any significant impact on the survival activities among adolescents ($F(1, 1196) = 0.02$, $p = 0.904$, $\eta^2 < 0.001$), meaning that $H_{03}a$ should not be rejected. On the contrary, gender had a statistically significant impact on the restiveness among adolescents ($F(1, 1196) = 4.20$, $p = 0.041$, $\eta^2 = 0.004$); specifically, the scores for restiveness were relatively higher for males ($M = 64.35$, $SE = 0.03$) compared to females ($M = 63.99$, $SE = 0.05$), and thus, $H_{03}b$ can be rejected. Nonetheless, the obtained effect size was minimal (only 0.4% of the explained variance). Moreover, gender failed to exert any significant effect on social vices curbing ($F(1, 1196) = 0.96$, $p = 0.328$, η

Table 6: Location Moderation Effects (Factorial ANOVA)

Hypothesis Component	Dependent Variable	F (location)	df	p	η^2	Decision
$H_{04}a$	Adolescents' survival activities	1.93	5, 1192	0.087	0.008	Not rejected
$H_{04}b$	Adolescents' restiveness	1.66	5, 1192	0.143	0.007	Not rejected
$H_{04}c$	Social vices curbing	4.03	5, 1192	0.001	0.017	Rejected

The impact of location as a moderating variable is captured in Table 6 below using hypothesis $H0_4$. Location had no significant impact on adolescents' survival activities ($F(5, 1192) = 1.93$, $p = 0.087$, $\eta^2 = 0.008$), hence hypothesis $H_{04}a$ cannot be rejected. In the same way, location had no significant impact on restiveness among adolescents ($F(5, 1192) = 1.66$, $p = 0.143$, $\eta^2 = 0.007$), thus hypothesis $H_{04}b$ cannot be rejected. However, location had a significant impact on social vices curbing ($F(5, 1192) = 4.03$, $p = 0.001$, $\eta^2 = 0.017$) and therefore hypothesis $H_{04}c$ is rejected. The post-hoc analysis using Bonferroni method revealed that NorthCentral had the highest estimated marginal mean for curbing social vices ($M = 49.20$) followed by Southwest ($M = 48.89$), Northwest ($M = 48.17$), Northeast ($M = 48.17$), Southeast ($M = 47.92$), and SouthSouth ($M = 47.61$). Pairwise differences between NorthCentral and SouthSouth, Southeast, Northwest, and Northeast zones were significant ($p < 0.05$). Therefore, hypothesis $H0_4$ is partially rejected.

Table 7: Pairwise Location Comparisons for Social Vices Curbing (Bonferroni)

Geopolitical Zone	Estimated Marginal Mean	Significant Differences ($p < 0.05$)
North-Central	49.20	> South-South, Southeast, Northwest, Northeast
Southwest	48.89	None
South-South	47.61	< North-Central
Southeast	47.92	< North-Central
Northwest	48.17	< North-Central
Northeast	48.17	< North-Central

Note: Higher scores indicate greater endorsement of social vices (worse outcome).

Observation: High scores are associated with higher levels of social evils. Table 7 contains the pairwise comparison of social evils, which shows that the North Central area gave the highest score while the South South area scored the lowest.

Results for Research Question 2 (Qualitative): Adolescent Feedback

What is the feedback that adolescent participants give on their experience with each of the interventions (the jingles, the movie, and the crusades)? Research question 2 (Feedback about their experiences with the initiatives) has been addressed by doing a thematic analysis of data from focus groups (n = 180, 30 per zone).

Jingle group: Three major emerging themes include memorability (e.g., "The song stayed with me for an entire week, and I kept singing it while I was working"); accessibility ("I don't own a television set, but there is a radio app on my phone; therefore, I can listen whenever there is no electricity"); and credibility ("It appeared official, like government-produced content, so I took it more seriously than gossip I hear from other adolescents").

Movie group: Emerging themes included emotional impact ("When the boy committed suicide from drug abuse, I cried as if the boy was someone close to me"); realism issues ("The people acting in the film were too old to be adolescents, and the scenes depicting the village did not match our village"); and length ("25 minutes was too long; I started losing interest after 15 minutes").

Crusade group: Major themes include religiosity ("This talk made me think about my faith as a Christian; it was powerful"). Another emerging theme was exclusion ("I invited some Muslim friends, but they said the meeting was meant only for Christians"); and motivation ("The talk made me feel inspired, and I made many promises during the talk, but after a week, nothing remained in my mind").

4. Discussion of Findings

Findings from this experiment can be summarized into four main conclusions. To begin with, out-of-school Nigerian adolescents indulge in various forms of survival activities like casual labour (73.9%) and vocational training (65.9%) but also report engagement in substance abuse (smoking 55%, alcoholism 57%). Significantly, the adolescents see the root cause of restiveness to be structural – corruption (77%), poorly formulated economic policies (76%), and poverty (72%) rather than personal morality problems and consider restiveness to be a rational "way out" of such difficult circumstances (76%). Secondly, all the three strategies of NFES – jingles, movies, and crusades proved to be highly effective in reducing social vices with exceptionally large effect sizes (η^2 = 0.942-0.969). Thirdly, when compared to each other, the jingles were more effective than movies, which were better than crusades regarding the impact on all three variables and the respective pairwise differences achieved statistical significance. Lastly, gender acted as a moderator in relation to restiveness with males being more restless whereas location was found to affect vices reduction but not survival activities nor restiveness outcomes.

A high level of casual labour prevalence rate in adolescents (73.9%) is fully consistent with Adedokun et al.'s (2018) finding on the widespread practice of street hawking among Nigerian adolescents living in low socio-economic status. Similarly, the problem of substance abuse reported by 55% and 57% of the respondents correspondingly regarding smoking and alcoholism respectively is consistent with Adebiyi et al. (2019). A low prevalence of adolescents engaging in kidnapping (14%) and drug trafficking (14%) could result either from the adolescents' genuine unwillingness to commit serious crimes or from their reluctance to admit it because of social desirability bias. It is noteworthy that the latter explanation seems more plausible because of recruiting participants from an event on drug awareness campaign.

Consistent with Agbaji et al. (2018), corruption (77%), poor economic policy (76%), and the existence of restiveness as a rational way out (76%) were found to be key causes for restiveness among adolescents. The finding that 76% of participants viewed restiveness to be a rational response to their difficult situations is extremely worrisome because it suggests that they are making a rational decision. It confirms the Health Belief Model hypothesis about the importance of increasing not only adolescents' perceptions of the risks involved but also perceived benefits associated with alternative courses of actions.

Regarding the findings related to the comparative effectiveness of the three types of interventions, their validity should be interpreted carefully because this is one of the novelties of the current study and no previous research has investigated this issue. There are several reasons to believe that jingles should indeed outperform the other two forms of interventions. Recent work by Apena, et al (2026) has systematically assessed the role of these three strategies in mitigating adolescent restiveness and social vices in Nigeria, highlighting not only their effectiveness but also the implementation challenges and context-specific

solutions required for successful deployment across diverse Nigerian communities. First, cognitive load theory posits that due to their shorter duration (3 min vs 25 min for movies and 45 min for crusades), jingles do not exert as much demand on working memory capacity. Second, the reach and accessibility are different – radio still remains Nigeria's most popular means of mass communication especially in rural areas lacking electricity. Mobile phones equipped with an FM radio receiver are relatively affordable among Nigerian adolescents regardless of their economic standing. Lastly, the secular nature of jingles is likely to give them an advantage in a country with a religiously diverse population including 47% of Christians, 41% Muslims, and 12% belonging to other faiths.

However, the exceptionally large effect sizes (η^2=0.94-0.97) found in the current research should also be interpreted with caution. Typically, social and behavioural studies show effect sizes well below 0.25, with rare exceptions of those above 0.50. Hence, it is hard to believe that treatments assigned to participants explained such a high degree of variance between groups (94-97%), taking into account pretest scores. Possible explanations include extraordinary power of the interventions, restriction of the range (very low within-group variance), and strong correlation between pre- and posttests combined with a lack of error variance. Since the standard deviation post-tests were approximately 0.04 SE according to Table 4, very low variability should be expected within treatment groups, which is not a typical occurrence among adolescent populations.

In terms of moderating variables, the gender moderation in relation to restiveness with males proving to be more restless is fully consistent with Ponam et al. (2023). Indeed, numerous criminology studies have demonstrated that adolescent boys tend to show more propensity for externalizing behaviour than girls. However, the fact that gender moderated vices reduction but not the effectiveness of the intervention itself should be noted as well. In particular, the very small effect size (η^2=0.004) shows how little variance in restiveness (explaining only 0.4%) gender explains.

Lastly, location was found to moderate vices reduction with the North Central zone demonstrating the highest sensitivity. It should be noted that the Federal Capital Territory, Abuja belongs to this geopolitical zone and it is the most diverse one in terms of religion (47% Christians, 41% Muslims) and ethnicity (12%). Hence, this diversity explains the high effectiveness of jingles as a form of intervention because it can be described as a secular one. The non-significant location effect on survival activities and restiveness implies that these phenomena result from similar socio-economic conditions across all geopolitical zones.

5. Conclusion

It can be concluded without much reservation that non-formal educational approaches such as jingles are very effective at alleviating social vices and restlessness in Nigerian out-of-school youths within an experimental setup. There are several limitations to these conclusions that should be highlighted. Firstly, this is based on one trial lasting only three weeks, with posttesting right after. Secondly, this sample was selected through participation at an NDLEA event, and hence, is not necessarily the most disadvantaged group of youths. Thirdly, all results were based on self-reporting of the respondents. Fourthly, since there was no true control group, we cannot discount any history or regression to the mean effects. Lastly, since this study uses religion, it might well underestimate the efficacy of such interventions. Taking all these limitations into consideration, it can be seen that the convergent evidence from three dependent variables, a large sample size, geopolitical variety, and quantitative/qualitative data make jingles an attractive intervention strategy against social vices.

6. Recommendations

Implications for Policy and Recommendations

To government authorities: Enhance investments in non-formal education significantly, focusing on jingles in sensitization efforts. Adopt harsher penalties for corruption and legislations that ensure sustainability in governance. Programmes should be continuous regardless of changes in administrations.

To program implementers: Create centers of skill innovation and self-reliance together with mentorship and financial support. Include extra parts focusing on managing anger and resolving conflicts among males. Strategies should vary regionally and prioritize the improvement of infrastructure in South-South and formative research in the area.

To curriculum planners and developers: Incorporate principles of NFES in both formal and non-formal curriculums, as well as hold sensitization efforts periodically by relevant institutions.

To future researchers: Conduct longitudinal studies involving follow-ups after 6, 12, and 24 months, cost-effectiveness analysis of programmes, factorial study design for testing combined intervention programmes,

studies in implementation science for replicability, replication studies in other West African countries, qualitative research in South-South and the development of standardized effectiveness assessment tools for NFES.

To development partners (UNICEF, UNESCO, WHO, World Bank): Offer technical assistance to carry out cost-effectiveness analysis of programmes and plan for scaling up. Fund multisite RCT with a follow-up after 12 months including biomarkers and aspects of implementation science research.

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Development and Assessment of Upper Basic Students' Conceptual Understanding of Mathematics Knowledge Using Two-Tier Diagnostic Test in Kogi State, Nigeria

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Abstract. Assessment of students' mathematics learning outcomes and instruments used in measuring the learning outcome are fundamental to the teaching and learning process of mathematics at the upper basic level of education. This study investigated development and assessment of upper basic students' conceptual understanding of mathematics knowledge using two-tier diagnostic test in Kogi State Nigeria. The study adopted instrumentation design, the population of the study were all the (50, 851 upper basic students of Kogi state. The sample consist 668 upper basic students which were selected using multistage sampling techniques. Two-Tier Mathematics Diagnostic Test (TTMDT) was developed by the researchers in three stages. the instrument TTMDT was trial tested on students outside the target population to establish the reliability of the instrument. Kuder-Richardson Formula 20 was used to measure the internal consistency reliability of the instrument. Data collected were analyzed quantitatively using frequency counts and percentages as well as descriptive statistics of mean and standard deviation to answer the research questions. The hypotheses were tested using t-test and analysis of variance (ANOVA) at 0.05 level of significance. The study adopted partial credit model in scoring. The findings of the study indicates that two-tier diagnostic test is valid and reliable to distinguish students who understand the concepts from those who misunderstood, and with the use of Rasch analysis two-tier test items could be improved upon by rewording items that showed anomalies base on the individual-item fit. It was recommended that teachers should adopt two-tier diagnostic test in assessing their students in Mathematics.

Keywords: Development, Two-Tier, Conceptual Understanding, Upper Basic, Diagnostic Test.

1. Introduction

The role of Mathematics towards realizing the nation's scientific and technological aspiration is indisputable. According to Sunday and Haruna (2024) Mathematics is integral to daily life and everyone's long-term planning. Thus, Mathematics plays a significant role in human kind's ability to survive on Earth. This likely explains why arithmetic is taught as a required subject in elementary schools everywhere, including Nigeria. As such, no nation can thrive well without mathematics. This implies that Mathematics has much to offer in solving the problems of mankind by being the gateway to scientific and technological development of any nation. Consequently, the need to develop the necessary mathematical, scientific, and technological knowhow of the next generation demands assessing their conceptual understanding. However, for the purpose of this study, the upper basic mathematics curriculum will be considered, because at this level so many corrections can still be easily affected on a learner's mind.

Given the significance of mathematics, it is essential that students learn and understands Mathematics concepts. While concept is generally defined as an abstract or generic idea generalized from particular instances (Merriam-Webster's Dictionary, 2012), Ben-Hur (2016) notes that concepts are mental structures of intellectual relationships. Therefore, conception is the ability to form or develop correct mental representations of fundamental mathematical

ideas. This implies that conceptual understanding is knowledge rich in relationship and understanding; a connected web of knowledge; a network in which the linking relationships are as permanent as discrete bits of information and cannot be learned by rote, but thoughtful and reflective mental activity. Students with conceptual understanding isolate facts and methods. A student is not just taught how to do the mathematics but also the why behind doing it. Students are encouraged to see the bigger framework that underlies all fundamental mathematics ideals and to think fluidly so that they are able to apply their mathematics skills to a wide variety of problems. Ben-Hur (2016) maintains that conceptual understanding involves knowledge of concepts and recognizing their applications. Thus, conceptual understanding is deep and justifiable knowledge of mathematical ideas and concepts that aligns with those of mathematics experts and, that which reflects students' ability to reason in settings involving the careful explanation and or application of concepts. Onah (2019) attributes students' poor knowledge or conceptions of Mathematical knowledge to their prior experience exposed to such as perception, language, and cultural background, peer groups, belief among others, giving rise to misconceptions or alternative conceptions. The resulting misunderstanding or misconceptions if not challenged, become integrated into students' cognitive structures and interfere with subsequent learning. As a consequence, students will persistently experience difficulty in integrating any new information within their cognitive structures, resulting in an inappropriate understanding of new mathematical concepts. This could lead to poor learning outcome.

Gender differences remain a prime area of research in mathematics education with studies being carried out all over the world. On a similar note, Awofala (2017) found out that male students outperformed their female counterpart on average in mathematics, while Anjum (2016) and Ogannaya; Okafor; Abonyi and Ugama (2016) findings revealed that female students outperformed male counterpart in Science and Mathematics subjects. However, studies such as Alex and Mammen (2014) reported that gender differentials in Mathematics among male and female is converging, hence they perform similarly as a result of their thinking levels. This view was upheld by Timayi, Ibrahim and Sirajo (2016) who found no statistical difference between the performance of male and female students in Mathematics. According to Adeniyi and Kajuru (2016), even students (male or female) considered as higher achievers and achieving equally can also hold some unexpected mathematical misconceptions.

A two-tier test is a two-level multiple-choice question that diagnose students' misconceptions and determine students' conceptual understanding (Mutlu & Sesen, 2015). While the first tier of the two-tier test examines content knowledge; the second tier examines the reasons or supporting conception underlying such knowledge. In the two -tier diagnostic test, the items are specially designed to identify alternative conceptions or misunderstanding in a defined area. It is different from the regular multiple-choice tests in that the test items are usually constructed based on students' misconceptions that might be identified through open-ended questions unlike regular multiple-choice test items. Two-tier tests are generally superior to conventional multiple-choice tests because they provide researchers with an understanding of students reasoning behind their answers (Onah, 2019).

Some researchers have also developed instruments to help in this area (Ramli, Talib, Hassan & Manaf, 2020 ; Irawan & Wilujeng, 2020) but very few were seen done in mathematics and the instrument developed was not strong enough to effectively assess junior students' conceptual understanding and identification of misconceptions of mathematics knowledge, because many used concept mapping and simple multiple – choice test. The need to assess the conceptual understanding of learners and to identify any misconception they may hold in Mathematics necessitated this study. Hence, the study seeks to develop a reliable and valid instrument to assess the conceptual understanding and misconception of mathematics knowledge in upper basic secondary school using two-tier diagnostics test in Kogi State.

1.1 Statement of the Problem

It is no longer news that mathematics is the bedrock that provides the springboard for the growth of science and technology. Adequate use of Mathematics in modern science and technology is a sure way to harness all the natural resources (human and materials) which advances the economy of the nation. However, despite the attention mathematics gets, not much improvement in terms of students' performances has been recorded. For a long time, Mathematics is being seen as a difficult subject to learn, yet, it is needed for a meaningful and effective living in this modern age (Gafoor & Kurukkan, 2015). Shartz (2014) reported that students view mathematical concepts as the most difficult to learn. This has hindered many children from achieving the desired outcome in their mathematics performances. The (Basic Education Council Examination (BECE) results from 2018 to 2022 in Kogi State (Ministry of Education, Lokoja, 2023, This indicates that a lot is still needed to be done

for mathematics knowledge of upper basic secondary school students to come up to its desired height. As mathematics is a requirement of further study of the sciences, it has affected a large number of students in science related courses. Thereby, bringing set back in National development of the nation.

Some other researchers have also tried to develop instrument to cater for the proper assessment of the conceptual understanding of students but some of the instruments are limited to specific topics. It is against this background that the object of this research is to develop a valid and reliable instrument to assess upper basic school students' conceptual understanding in mathematics knowledge using two-tier diagnostics test in Kogi State.

1.2 Research Questions

The following research questions guided the study:

- What are estimates of item parameters of the Two-tier Mathematics diagnostic test (TTMDT) of upper basic student developed by the researchers?
- What is the internal consistency reliability estimate of the two-tier diagnostic test instrument developed to assess upper basic students' conceptual understanding as measured using a two-tier diagnostic test instrument?
- What percentage of upper basic students hold right conception as compared to those holding misconceptions of mathematics knowledge in Kogi State as measured using TTMDT?
- What is the mean difference between Male and Female upper basic students' conceptual understanding of Mathematics knowledge using anchor items in TTMDT?

1.3 Hypotheses

The following hypotheses were tested at 0.05 alpha level of significance

$H0_1$.There is no significant difference in the scores of upper basic 1, 2 and 3 students' conceptual understanding of Mathematics knowledge using TTMDT.
$H0_2$There is no significant difference between upper basic 1male and female students' conceptual understanding of Mathematics knowledge using TTMDT.

2. Literature Review

2.1 Theoretical Framework

2.1.1 Constructivism Theory by Jean Piaget's work in 20th Century.

Constructivism theory was founded by Jean Piaget (1896-1980). As a biologist, he was interested in how an organism adapt to the environment and how previous mental knowledge contributes to behaviour. It is a theory in education which posits that individuals do acquire knowledge and understanding by actively perceiving it within a direct process of knowledge transmission. Learners construct new understandings based on past knowledge through experiences. As events occur, each person reflects on their experiences and incorporate the new ideas with their prior knowledge. The root of constructivist learning theory date back to Jean Piaget's work in 20th century. He suggested that through processes of assimilation, human build their own knowledge. Jean Piaget is known as one of the first theorist in cognitive psychology. His theories indicate that humans create knowledge through the interaction between their experience and ideas.

This theory is very much related to this study in the sense that learners are encouraged to get conceptual understanding of whatever is meant to be done before it is been done. That is, the knowledge one has beforehand is instrumental to creating new improved knowledge, which also means that if a learner has misconceptions in any area of mathematics, it must be corrected before new knowledge can be created. This theory leads to changes in learners' schemas. And subsequently encourage conceptual understanding of the concepts in mathematics.

2.1.2 Item Responses theory

Item response theory (IRT) has its roots in Thurstone's work to scale tests of "mental development" in the 1920s.Though in several other people's works, its origin can be traced back to the early 20th century when pioneers like George Rasch and Frederic Lord made significant contributions to its development. Rasch introduced the concept of item Characteristic Curve (ICC), which forms the basis of IRT models. Thurstone's method is based on the assumption of a latent scale underlying the responses on which both the items and individuals can be mapped. No doubt his idea of scale was inspired by earlier developments in psychophysics in which probabilities of psychological response to physical stimuli are modeled as a function of the strength of the stimulus. The foundation of IRT

is a mathematical model defined by item parameters**.** For dichotomous items (those scored correct/incorrect), each item has three parameters:
a: The discrimination parameter, an index of how well the item differentiates low from top examinees; typically ranges from 0 to 2, where higher is better, though not many items are above 1.0.
b: The difficulty parameter, an index of what level of examinees for which the item is appropriate; typically ranges from -3 to +3, with 0 being an average examinee level.
c: The pseudo-guessing parameter, which is a lower asymptote; typically, is focused on 1/*k* where *k* is the number of options.

In addition to being used to evaluate each item individually, IRFs are combined in various ways to evaluate the overall test or form. The two most important approaches are the conditional standard error of measurement (CSEM) and the test information function (TIF). The test information function is higher where the test is providing more measurement information about examinees; if relatively low in a certain range of examinee ability, those examinees are not being measured accurately. The CSEM is the inverse of the TIF, and has the interpretable advantage of being usable for confidence intervals; a person's score plus or minus 1.96 times the SEM is a 95% confidence interval for their score.
This present study has developed an instrument and uses a branch of Item Response model (Rasch) to check the psychometric analysis of the instrument and at the same time use it in analyzing reliability of the instrument. This theory is relevant to this study because it involves creating or developing an instrument that overcome classical testing limitations.

2.2 Upper Basic Secondary Schools Mathematics Curriculum in Nigeria

Reformation in school mathematics curricula goes along side with the reforms in Nigeria education system. Reform in education, would mean attempting to evolve a system of education that will respond positively to the needs and demands of the changing nature of the society. The growth of knowledge and techniques required for the industry, science, commerce, medicine and technology continue. All the future needs cannot be given or satisfied today but a solid foundation can be laid in readiness for the demands of these disciplines. To conform to these growing social needs, mathematics has been scrutinized and found to need changes. Thus, the so-called traditional mathematics (Arithmetical process) become grossly inadequate to cope with the modern needs, which gave room for the introduction of modern mathematics. In the first half of the 20th century, curriculum development emphasized shop - and – yard skills prompted by the idea of functionalism (education you can see), some educators focused on identifying minimal competencies needed to perform different jobs; dollars – and – naira mathematics for clerking, feet – and – inches mathematics for carpentry, measuring cup - and- spoons mathematics for cooks and home mathematics new 9–3–4 system of education in Nigeria which aims at reinforcing the extant 6-3-3-4 system of education introduced in 1983, consist of the first nine years of basic and compulsory education up to the Jss3 levels, three years in the senior secondary school and four years in the tertiary institutions. Its first 9- years duration which is popularly known as Universal Basic Education was designed to meet the millennium development Goals (MDGS) and Education for All (EFA) by 2015 (Federal Republic of Nigeria, 2015).

2.3 Conceptual Understanding

Mathematics curriculum is made up of concepts, skills and generalizations. A concept is an abstract or generic idea. It is a symbolic representation (almost always verbal) used in the process of abstract thinking and possessing a general significance, corresponding to an ensemble of concrete representations with regard to what they have in common. This implies that a concept is characterized by its expression of an idea, a general ideal representation of a class of objects, based on their common features. Thus, concepts are mental models that may be constructed by the learners. Each of these concepts, according to Nisa, Waluya, Kartono and Mariani (2020) is an abstraction, namely a mental image of an object received (for example a triangle), a mental process that becomes a concept (such as counting into numbers), and a formal system (such as a permutation group). Which is based on its properties with a concept built through deductive logic. A mental model of concepts constructed by learners which are inconsistent with the experts' opinion, result in a misconception held by the learners. Meanwhile, a perfect grasp of concept brings about the term conceptual understanding. There is a world of difference between a student who can summon a mnemonic device to expand a product such as (a + b) (x + y) and a student who can explain where the mnemonic comes from. Mill (2016) succinctly points out that one of the conditions necessary for conceptual understanding to take place is that misconceptions if any, must be corrected. Therefore, this study is carried out to determine area of junior secondary school student's conceptual understanding and misconception in mathematics knowledge using two-tier diagnostic test in Kogi State.

2.4 Open-ended Tests

In order to investigate students' understanding, open-ended free-response tests are commonly used. In open-ended tests, students are given the opportunity to state in writing everything they know about the problem/subject/concept. Students are also asked to state the reason/justification for their answers to the problem. This allows the teacher to identify possible misconceptions. Distractors in multiple-choice tests are prepared on the basis of students' responses to test question and to other open-ended questions. This method gives students more time to think and write about their idea. It is to identify what students know and why they believe it to be valid, but it is difficult to interpret and analyze the results of the open-ended questionnaires (Gurel, Eryilmaz & McDermott, 2015). Furthermore, because of language problems, identification of students' misconceptions becomes difficult and more so that students are less eager to write their answers in full sentences (Gurel & Eryilmaz, 2015).

2.5 Multiple-choice Tests

Multiple-choice tests have been used for measuring students' understanding of concepts as they enable a large number of students to be sampled in a given amount of time. It also helps to overcome the difficulties encountered in open-ended testing processes. These tests are also easy to administer and accurate in scoring and the results obtained are also easily processed and analyzed (Gurel, Eryilmaz & McDermott, 2015). A typical multiple-choice test item has a stem, which may be a statement or a question and four or five possible answers of which only one is correct. A student can give a correct answer with a wrong reason or a wrong answer with a correct reason (Kirbulut & Geban, 2014). Therefore, to overcome the limitations of multiple-choice tests in assessing conceptual understanding and identification of misconceptions among students, researchers have proposed the use of multiple-choice tests items with distractors, which are used based on students' answers to open-ended questions and/or other essay questions (Kanli, 2014). Kanli (2014) found the use of justifications when answering multiple-choice test items to be a sensitive and effective way of assessing meaningful learning among students, and addresses the extent of the limitations of traditional multiple-choice test items. The positive outcomes of findings related to students' justifications to test items led to the development of the two-tier multiple-choice diagnostic instrument, specifically for the purpose of measuring conceptual understanding and identifying students' misconceptions in limited and content areas.

2.6 Two-tier Diagnostic Tests

The two-tier diagnostic instrument is a multilevel assessment model in knowing the weakness and mistakes of students in understanding a concept. Two-tier diagnostic tests consist of two sections at least. The first section aims to diagnose how the individual interprets discipline knowledge. In the second section, students are asked to state the reason(s) for their answer in the first section (Kanli, 2015). The first tier of each multiple-choice item consists of a content question having usually two to four choices, one of which is the correct answer and the rest are distractors. The second tier of each item contains a set of usually four possible reasons for the answer given to the first part. The reasons consist of the designated correct answer, together with identified students' conceptions and/or misconceptions. When more than one alternative conception is given, these are included as separate alternative reason responses. The use of two-tier test is aimed at reducing the guessing factor of students because students are required to provide reasons to the answers they choose. (Lengkong, Istiyono., Rampean, Rejeki, Tumanggor&Nirmala,2020).

2.7 Empirical Studies on Conceptual Understanding of Mathematics

Yang, Leung, and Zhang (2019) investigated junior secondary school students 'conceptions understanding and approaches to learning mathematics and the relationships in Mainland China. The study employed quantitative and qualitative research design. Two factors of students' lower-level conceptions of learning mathematics, "memorizing" and "testing", were the strongest predictor for the surface approaches to mathematics learning, while students' higher-level conceptions of learning mathematics, such as "applying" and "understanding and mathematical thinking", had a noticeable elect on their deep approaches to learning mathematics. However, under the pressure of examination in Mainland China, "understanding and mathematical thinking" was also found to exert quite a strong influence on students' "surface motive".

Malatjie and Machaba (2019) explored learners' conceptual understanding of coordinates and transformation geometry through concept mapping in South African University. A qualitative case study design was employed in this study, data were collected using an investigative task, observation and reflective interviews on a sample of 34 Grade 12 Mathematics learners. The study findings revealed that, although

some leaners struggled with linking words and omitted some concepts in their concept maps, there were some indications of conceptual understanding of coordinate and transformation geometry when the learners were probed during the interview. Thus, the learners' conceptual understanding of coordinate and transformation geometry could be improved when they are taught, using concept mapping.

Empirical Studies on development and usage of Two-Tier Diagnostics Test for accessing conceptual understanding and misconception

Several studies have been done in connection with students' conceptual understanding using a two-tier diagnostic instrument.

Aliyu, (2015) developed and validated Mathematics Achievement Test using the Rasch model. An instrumentation research design was adopted. The result showed that 65 items not only met the Rasch model assumption of measurement construct (fitting and invariant) but also demonstrated good psychometric properties. The result showed that items and person separations indices were 13.17 and 2.93 while item and person reliability were 0.99 and 0.78 respectively. The MNSQ for both infit and outfit were 0.94 and 1.08 respectively while the ZSTD for both infit and outfit are -1.7 and +2.0 respectively which were within the acceptable range of 0.7-1.1 for MNSQ for sample > 1000 while -2.0 to +2.0 for ZSTD. The difficulty level of the items ranges between -1.95logit to 7.45logit. Also, the output results were expressed in both wit and logit units.

Aligba and Iorja (2021) Assessed conceptual and procedural knowledge of students with special needs in Mathematics in Benue State Algebraic Diagnostic Test (TTADT) item cycle I and cycle II were adapted and validated. The reliability of TTADT was calculated using Pearson Product Moment Correlation Coefficient and was found to be 0.96. Mean and Standard Deviation were used to analysed data to answer the research questions, while t-test statistics was used to test the null hypotheses at 0.05 level of significance. The finding of the study shows that the Mean scores of the SSN in Concept Knowledge and Underlining Reasoning were very low below 40% (31.25% and 21.08% respectively), while that of Procedural Knowledge is 40.69% and that there exist a significant difference between the performance of SSN in Conceptual Knowledge and Underlining Reasoning in Algebra in favour of Conceptual Knowledge ($t=5.71$; $P=0.00<0.05$).

Lengkong, Istiyono, Rampean, Rejeki, Tumanggor and Nirmala (2020) in their research to develop a two-tier test instrument to diagnose students' conceptual understanding abilities and knowing the level of student misconceptions on the topic of simple harmonic motion. The test instrument developed and tested to 60 students of Class X MIPA was able to measure the error of students by 30.5% having misconceptions and by 27.6% not understanding the concept. Of the nine items given with different conception, the largest percentage of students' misconceptions is in item number 4, which is 68.3% of students experiencing a misconception about the relationship of spring length to their frequency value.

Thus, it was clear that from the above reviews that the use of two-tier diagnostic test is effective in assessing the conceptual knowledge and in identifying students' misconceptions about knowledge. Only few of these studies above took place in Nigeria but in other part of Nigeria and mostly all in pure sciences. Therefore, this study seeks to find out whether the two-tier diagnostic test that was developed by the researcher was reliable and valid to access the students' conceptual understanding and identify the misconceptions in Mathematics in Kogi State, Nigeria.

3. Research Methodology

3.1 Research Design

The study adopts instrumentation design. It is a design which typically involves creating tools to measure or assess something. For the purpose of this study, instrumentation test survey design was employed. It is a type of research study that focuses on introduction of new or modified content, procedure, technologies or instruments of educational practice (Ihekwaba, Nkwocha & Unamba, 2019)..

3.2 Population

The population of this study consists of all students in Upper Basic classes of the secondary Schools in the twenty-one (21) Local Government Area of Kogi Stat, Nigeria. Their total number stands at fifty thousand, eight hundred and fifty-one (50, 851) students for the 2024/2025 academic session. There are 26,184 males and 24,667femalestudents

3.3 Sample and Sampling Technique

The study employed multi-stage sampling procedures to select six hundred and sixty- eight (668) students of the upper basic students of kogi State. The most used sampling method in this study under the multi-stage

procedure is the simple random sampling method. Simple random sampling is used to make statistical inferences about population (Thomas, 2023). It provides each individual or members of a population with an equal and fair probability of being chosen.

3.4 Instrumentation

Two-Tier Mathematics Diagnostic Test (TTMDT) was developed by the researcher in three stages adopting procedures by Treagust in (widiyatmoko & shimizu, 2018) was used for the study. The following procedures were involved; defining the content area of the study, obtaining information about students' conceptions by having students provide free response answers and reasons for their answers, which is the first cycle and several steps in developing the diagnostic instrument and the validation of final version which is the second cycle,

3.5 Defining Content Area of the Study

This stage involved the researcher defining the content boundaries, which will further be the knowledge required to understand the mathematics knowledge as specified in the Nigerian upper basic secondary school Mathematics curriculum.

3.6 Obtaining Information about Students' Conceptual knowledge (Open-ended Test)

An open-ended test items was first developed by the researcher as a Two-Tier Mathematics Diagnostic Test (TTMDT) cycle 1 to elicit students' conceptual knowledge from their written responses. The test items consist of only a stem requiring students to supply the answers and advance reasons for their answers. The test had twenty items for upper basic 1, twenty items for upper basic 2 and twenty items for upper basic 3. The purpose of the cycle 1 test was to identify students' conceptual understanding or misconception (correct and incorrect) which could serve as distractors for the construction of cycle 2 items. The test is designed to elicit students' spontaneous conceptions rooted deeply in the minds of the students the cycle two (2) is a multiple-choice instrument that has both the multiple-choice options to choose from and the underlying reasoning parts. To ensure construct validity, TTMDT was developed based on the table of specification

3.7 Development of the Two-Tier Multiple-choice Diagnostic Instrument

This was developed based on the conceptual understanding and misconceptions (responses) obtained from the administration of cycle 1 test items. Each item in the open-ended test items on students was repeated to form a Two-Tier Mathematics Diagnostic Test (TTMDT) cycle II. Each test item in the instrument consists of a stem followed by a two-tier multiple-choice question. The first tier is the conventional content questions with four possible answers (one correct and three distractors) related to students' misconceptions in addition to the mathematically correct answer. The second-tier question consist of multiple-choice set of reasons students had given that is associated with the answers that were given to the first-tier in addition to the mathematically accepted reasons. Students' answer to each item will be scored correct when both the correct choice (answer) and reasons are correct with full credit (2 marks). Getting part only one correct earned a partial credit (1mark). The instrument consists of 20 two- tier multiple choice objective test items each for upper basic 1, 2 and 3 respectively. There are five (5) questions called anchor questions, items common to the three upper basic classes. Items were picked from topics from upper basic 1 and repeated in upper basic 2 and 3. With this, the researcher was not bias in verifying students conceptual understanding and the misconceptions across the three classes (See Appendix H pp. 180). Furthermore, the test items were subjected to psychometric analysis. This was an attempt to determine the quality of the test in terms of how difficult the test items may be using the Rasch approach. These were calculated by computing the item difficulty for each class of test items of (TTMDT) administered on students. Metha and Mokhasi (2014) recommend Item difficulty (I.D) 0.30 – 0.7 as acceptable range (See appendix I pp. 181) 20 items were submitted for the psychometric analysis and the 20 items per class were considered for the study. Since the distractors are based on students' responses from the administration of the open-ended questionnaire, the psychometric indices of distractors are excluded from the analysis.

3.8 Validation of the Instrument

The instruments TTMDT cycles I and II for the study were subjected to face, content and construct validation by five experts. Three (3) in Science and Mathematics Education Department, Benue State University, Makurdi and two experts in measurement and evaluation departments, from Prince Abubakar Audu University, Ayingba, Kogi State. The experts' advice was sought in terms of scope of coverage, content relevance, language level, ambiguity and vagueness of expression as well as suitability of items for upper basic mathematics topics specified. The advice and comments from the experts were used to

modify the items of the first cycle and the development of the final version of the items of the two-tier diagnostic instrument. The final version of the two-tier multiple-choice diagnostic instrument then emerged (cycle 1 and 2) and was used in this study. The modification instructions were attached.

3.9 Reliability

Reliability is the degree to which the result of a measurement, calculations, or specification can be depended on to be accurate. Research instrument is highly reliable if the test consistently measures what it is expected to measure under identical conditions. According to Aljaghsi, Abu, Algutaibi and Mundt (2021) the stability of scores over time requires all other things to be equal. That is, for test or instrument to have good reliability it means that the respondent will obtain the same score on repeated testing as long as no other extraneous affect the score.

The final version of the instrument TTMDT was trial tested on students outside the target population to establish the reliability of the instrument. Kuder-Richardson Formula 20 was used to measure the internal consistency reliability of the test in which each question only has two answers right and wrong. The value for KR-20 ranges from 0 to 1, with higher reliability. The students were tested and the scores gotten were used in establishing the internal consistency reliability coefficient of the instrument based on Kuder and Richardson formula (KR- 20) and the reliability coefficient stands at 0.78, 0.83 and 0.77, for upper basic 3, 2 and 1 respectively (See appendix K pp. 190). However, the reliability coefficient bases on IRT is also given as 0.76, 0.74 and 0.68 respectively.

3.10 Method of Data Collection

In collecting data, the researcher obtained a written permission from the university that was presented at the sampled schools for proper cooperation of the schools during the data collection exercise. Eighteen (18) Mathematics teachers were trained as research assistant during the exercise, three (3) Mathematics teachers per school. The Two-Tier mathematics Diagnostic Test (TTMDT) cycle II that was developed by the researcher was used for the data collection. The researcher organized a day orientation programme for the administration of the test items in each school. The programme Manual covered:

- The concepts of Two-Tier multiple-choice questions
- The essence of underlying reasons as the second - tier multiple-choice test items
- The use of TTMDT and the general conduct of the test administration

The programme took two (2) hours per day in each chosen school. One hour for the orientation and one hour for the administration of the instrument. These research assistants (three in each sampled school) assisted in the administration of the instrument and collection of the data. This reduced the cases of misuse of the instrument by the respondents. The instruments were administered on the students and the data collected immediately.

3.11 Method of Data Analysis

Data collected were analyzed quantitatively using frequency counts and percentages as well as descriptive statistics of mean and standard deviation to answer the research questions. The hypotheses were tested using t-test and analysis of variance (ANOVA) at 0.05 level of significance. The study adopted partial credit model in scoring. In this model, student received a score of 2 marks if he/she responded correctly to the first tier (content choice) and correctly to the second tier (reasoning part), signifying full conceptual understanding of mathematical knowledge. Also correct answer to the content part and wrong reason attracted a score of 1 mark, signifying partial understanding (misconception) while wrong answer and correct reason or wrong answer and wrong reason earned 0 marks, signifying no conceptual understanding or lack of knowledge This is because if students' ability is assumed to progress from knowing to explanation, students whose answer to first tier is incorrect but correct explanation should not exist on the progression path and this pattern can be attributed to guessing. Reliability analysis using Rasch model which relies on Item Response Theory (IRT) were used to answer the research questions 1 and 2 Rasch analysis is a paradigm for designing and testing instrument used for assessing abilities and other attributes and addresses measurement issues required for validating an outcome measure (like a test), including internal construct validity. In Rasch partial credit model, a reliability of at least 0.50 is required for a separation index of 1 (Aliyu, 2015).

4. Analysis and Interpretation

The data collected were presented and analyzed using Dichotomous Rasch Model software programme and each variable was coded as 0 or 1 with the type of numeric-continuous in jamovi, to answer the research question one and two. Frequency count and simple percentages were used to answer the research questions three, while means and standard deviations

were used to answer research questions four, five, six, seven, eight, nine, ten and eleven. T-test and ANOVA were used to test the hypotheses at 0.05 level of significance.

Research Question 1: What is the estimate of item parameter of Two-tier Mathematics Diagnostic Test (TTMDT) of upper basic 1, 2 and 3 respectively?

This research question was answered by using dichotomous Rasch Model software program to establish the psychometric property of the instrument. The results are presented in Table 1 and Fig 1 for upper basic 3, Table 2 and Fig 2 for upper basic 2 and Table 3 and Fig 3 for upper basic 1.

Table 1: Estimates of Item Parameter of Two-tier Mathematics Diagnostic Test (TTMDT) for Upper Basic Students

Table 1.0: Item Statistics

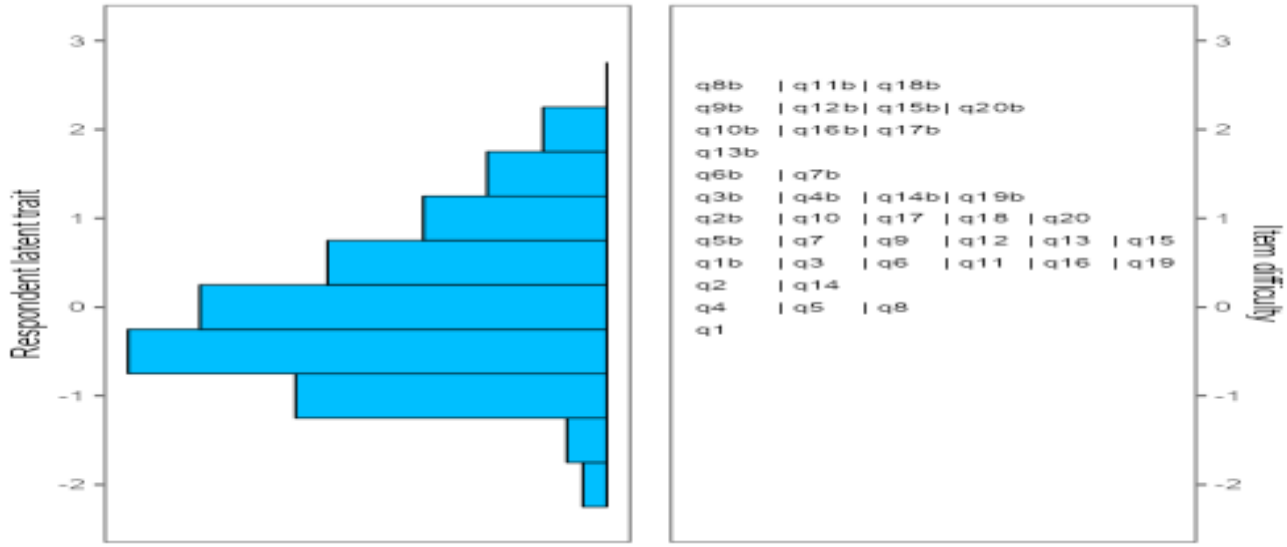
	Proportion	Measure	S.E.Measure	Infit	Outfit
q1	0.5314	-0.1486	0.137	1.054	1.105
q1b	0.3849	0.5192	0.141	1.111	1.143
q2	0.4603	0.1715	0.138	1.003	1.003
q2b	0.3054	0.9147	0.148	0.973	0.989
q3	0.3724	0.5791	0.142	0.979	0.980
q3b	0.2385	1.2921	0.160	0.946	0.927
q4	0.5021	-0.0170	0.137	0.973	0.956
q4b	0.2427	1.2667	0.159	0.938	0.918
q5	0.5230	-0.1110	0.137	1.013	1.005
q5b	0.3515	0.6808	0.143	0.910	0.888
q6	0.3891	0.4994	0.141	1.020	1.051
q6b	0.2050	1.5063	0.168	0.918	0.875
q7	0.3556	0.6603	0.143	0.989	0.986
q7b	0.2008	1.5347	0.169	0.972	0.975
q8	0.4728	0.1148	0.137	1.016	1.022
q8b	0.1004	2.4111	0.222	1.053	1.206
q9	0.3264	0.8064	0.146	0.983	1.049
q9b	0.1213	2.1841	0.205	0.954	0.884
q10	0.3013	0.9368	0.149	0.994	0.976
q10b	0.1339	2.0629	0.197	0.967	0.822
q11	0.4142	0.3819	0.139	0.981	0.976
q11b	0.0921	2.5132	0.230	0.981	0.885
q12	0.3222	0.8278	0.146	1.046	1.035
q12b	0.1130	2.2707	0.211	0.979	0.881
q13	0.3515	0.6808	0.143	0.953	0.928
q13b	0.1757	1.7146	0.177	0.949	0.917
q14	0.4435	0.2474	0.138	0.981	0.982
q14b	0.2469	1.2417	0.158	0.991	1.007
q15	0.3556	0.6603	0.143	1.008	1.004
q15b	0.1213	2.1841	0.205	1.001	1.044
q16	0.4142	0.3819	0.139	0.995	1.006
q16b	0.1297	2.1023	0.200	0.947	0.879
q17	0.2887	1.0041	0.151	1.133	1.150
q17b	0.1381	2.0246	0.195	1.132	1.274

Table 1.0: Item Statistics

	Proportion	Measure	S.E.Measure	Infit	Outfit
q18	0.2971	0.9590	0.150	1.003	1.043
q18b	0.0837	2.6236	0.240	1.054	1.148
q19	0.4142	0.3819	0.139	1.033	1.031
q19b	0.2301	1.3437	0.162	1.029	1.021
q20	0.3054	0.9147	0.148	1.028	1.072
q20b	0.1130	2.2707	0.211	0.908	0.870

Note. Infit= Information-weighted mean square statistic; Outfit= Outlier-sensitive means square statistic.

Fig1a : Wright Map



Data in Table 1 shows the Rasch item statistics where the first column identifies the items (q1, q2, q3….. q20) and reasons to each corresponding item (q1b, q2b, q3b……qb20). Column 2 is the proportion, indicating the percentage of respondents that got the items (option and reason) correctly and this range from 0.11 to 0.53. The third column is the measure of item difficulty level, followed by the standard error (SE). The last two columns are the Infit and Outfit measures.

From the table, it shows that item 1 is the most correctly scored item with 53.14% to while item 17 was least correctly scored with 28.87% for the part a. The analysis showed that respondents find it difficult to provide correct reasons despite that the first items are correct. The range for correct reasons is from 0.08 to 0.38. Item 18 was the most difficult item for respondents to provide reason for correct option with only 8.37% correctly and the highest percentage (38.49%) of respondents got the correct reason on item 1. The third column (measure), further confirmed the easiest items (q4, q5, q1) with (-0.02, -0.11, -0.14) and most difficult items (q17, q18, q10, q20) with (1.00, 0.96, 0.94, 0.91). The acceptable threshold of Infit and Outfit (stable performance) ranges from 0.6 and 1.2, the spread of the values under Infit and Outfit are all within this range, which shows that all the items are pretty good, (Aliyu, 2015). Fig1 shows the wright map which is also known as item map. It shows the spread of item difficulty and person's ability. The item difficulty ranges from -0.02 to 1.00 for the options while the difficulty level of reasons for the correct options are 1.2 to 2.5. The figure also shows the person ability. The model fit indicates reliability coefficient of 0.76 which shows that items are good and very reliable

Research Question 2: What is the internal consistency reliability estimate of the two-tier diagnostic test instrument developed for assessing upper basic students' conceptual understanding and misconception of Mathematics knowledge?

Also using Dichotomous Rasch Model software program and each variable was coded as 0 or 1 with the type of numeric-continuous in jamovi, the research question two was answered.

Table 2: Person Reliability

Upper basic 3	Upper basic 2	Upper basic 1
0.76	0.74	0.68

Table 2 shows the model fit which indicate the person reliability. The person reliability of 0.76, 0.74 and 0.68 representing upper basic 3, 2 and 1 classes respectively shows that the items are good and reliable. K-20 gave a higher coefficient 0.78, 0.83 and 0.77, however the Rasch model software gave the most reliable ones because this software considered the all items, one after the other.

Research Question 3: What is the percentage of upper basic 1, 2 and 3 students holding right conception and those holding misconceptions of mathematics knowledge in Kogi State as assessed using TTMDT?

Table 3: Frequency and Percentage of Upper Basic 1, 2 and 3 Students Holding Right Conceptions of each Mathematical Concept in the TTMDT (n = 668)

	Items					
	Upper Basic!		Upper Basic 2		Upper Basic 3	
	Tier 1	Tier 1 & 2	Tier 1	Tier 1 & 2	Tier 1	Tier 1 & 2
	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)
1	58(36.2)	48(30.0)	124(46.1)	59(33.1)	127(53.1)	92(38.5)
2	92(57.5)	31(19.4)	182(67.7)	120(44.6)	110(46.0)	73(30.5)
3	84(52.5)	47(29.4)	133(49.4)	97(36.1)	89(37.2)	57(23.8)
4	72(45.0)	32(20.0)	170(63.2)	145(53.9)	120(50.2)	58(24.3)
5	63(39.4)	38(23.8)	125(46.5)	85(31.6)	120(52.3)	84(35.1)
6	90(56.2)	68(42.5)	140(52.0)	100(37.2)	93(38.9)	49(20.5)
7	77(48.1)	50(31.2)	130(48.3)	64(23.8)	185(36.6)	48(20.1)
8	85(53.1)	53(33.1)	191(71.0)	95(35.3)	113(47.3)	24(10.0(
9	70(43.8)	46(28.8)	97(36.1)	35(13.0)	78(32.6)	29(12.1)
10	91(56.9)	62(38.8)	87(32.3)	51(19.0)	72(30.1)	32(13.4)
11	83(51.9)	60(37.5)	126(46.8)	62(23.0)	99(44.4)	22(9.2)
12	66(41.2)	45(28.8)	112(41.6)	68(25.4)	77(32.2)	27(11.3)
13	56(35.8)	39(24.4)	106(39.4)	69(25.7)	84(31.5)	42(17.6)
14	68(42.5)	32(20.0)	131(48.7)	72(26.8)	106(44.4)	59(24.7)
15	70(43.8)	51(31.9)	126(46.8)	67(24.9)	85(35.6)	29(12.1)
16	63(39.4)	37(23.1)	177(65.8)	132(49.9)	99(41.4)	31(13.1)
17	43(26.9)	22(13.8)	235(50.2)	119(44.2)	69(29.9)	30(13.8)
18	69(43.1)	48(30.0)	151(56.1)	104(38.7)	71(29.7)	20(8.4)
19	68(42.5)	35(29.9)	136(50.6)	89(33.1)	99(41.4)	55(23.0)
20	39(24.4)	26(16.2)	135(50.9)	90(33.5)	73(30.5)	27(11.3)

The Results summary of the analysis in Table 3 revealed that 19 out of the 20 items for Upper Basic 1 have less than 40 percent (%) of the students with right conception. It also reveals that 16 out of the 20 items for Upper Basic 2 have less than 40 percent (%) of the students with right conception and finally the data revealed that all items for Upper Basic 3 have less than 40 percent (%) of students with right conception. This suggests high level of misconception in mathematics knowledge among Upper Basic students. The analysis also indicates that only 1 student of Upper Basic 1, 4 students of Upper Basic 2 and none of Upper Basic 3 students respectively had at least 40 percent of the items having right conceptions.

Research Question 4: What is the difference in the mean scores of Male and Female students' conceptual understanding using the anchor questions in TTMDT?

Table 4: Mean and Standard Deviation of Upper Basic Male and Female Student's Conceptual Understanding of Mathematics Knowledge Assessed Using Two-Tier Test

Sex	N	Mean ($\bar{x}$)	Standard Deviation (SD)
Male	351	3.35	2.12
Female	317	3.69	2.22
Mean Difference	0.34		

The summary result of the analysis in Table 4 shows that the mean conceptual understanding score of male students is 3.35 with standard deviation of 2.12, while that of the female students' conceptual understanding score is 3.69 with standard deviation of2.22. The result of the analysis indicates that the female students seem to edge the male counterpart in their understanding as their mean difference (0.34) is in favor of the female students.

The following hypotheses were tested at 0.05 alpha level of significance

Hypothesis 1

$H0_1$There is no significant difference among the scores of upper basic 1, 2 and 3 students' conceptual understanding of Mathematics knowledge.

Table 5: One Way-ANOVA for Comparison of the Mean of Upper Basic 1, 2 and 3 in their Conceptual Understanding of Mathematics knowledge

understanding2

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	62.602	2	31.301	6.727	.001
Within Groups	3094.302	666	4.653		
Total	3156.904	668			

The summary result of the analysis on Table 5 presents one-way ANOVA comparing the mean score of upper basic 1, 2 and 3students on their conceptual understanding in mathematics. The result indicated that observe mean differences among the groups is considered significantly at f= 0.304, P =0.001 < 0.05. Hence the hypothesis that there is no significant difference in the scores among upper basic 1, 2 and 3 students' conceptual understanding of Mathematics knowledge was rejected. This implies that there is significant difference in the score of upper basic 1, 2 and 3 students as assessed using TTMDT.

Hypothesis 2: There is no significant difference between male and female upper basic 1 students' conceptual understanding of Mathematics knowledge using two-tier diagnostic test

Table 6: T-Test Result of Male and Female Upper Basic 1 Students' Conceptual Understanding Scores of Mathematics Knowledge as Assessed Using TTMDT

Gender	No	($\bar{x}$)	SD	DF	t	Sig.	Discussion at P<0.05
Male	74	14.50	5.93				
158	- .313	0.755	NS				
Female	86	14.23	5.54				

Note: NS – Not Significant @ p > 0.05

The summary result of the analysis shown in Table 6 indicates that t = -0.313 and p = 0.755. Since the significant value (p) is greater than the set value for the study (p > 0.05), the hypothesis that there is no significant difference between the mean conceptual knowledge of male and female Upper Basic 1 students in Mathematics knowledge measured using two-tier diagnostic test, is not rejected. This implies that there is no significant difference between the male and female mean's conceptual knowledge upper basic 1 students as assessed using two-tier diagnostic test. The conclusion drawn is that there is no gender bias in students' understanding of the mathematics concepts as measured using two tier diagnostic test in upper basic1

5. Discussion of Findings

Findings arrived at in this research are discussed in this section.

5.1 Reliability and Validity of the Two-Tier Mathematics Diagnostic Test (TTMDT)

With the Rasch software program the researcher analysis of the TTMDT instrument of Upper Basic students' conceptual understanding and misconceptions of mathematics knowledge was done. The results from Table1 showed that the item separation index (reliability) of upper basic one, two

and three students were 0.76, 0.74 and 0.68 respectively. These values are considered reasonable for research purpose. This finding is in conformity with the finding of Aliyu (2015) that person separation index of at least 0.50 is required for a separation of 1. Result in Tables 1, 2 and 3 further revealed that the items summary as the infit ranging from 0.9 – 1.3 and outfit 0.79 – 1.3. Also, the difficulty level ranges from -0.02 to 1 and 1.5 for part a and 1.5 to 2.5 for part b indicating that the items are not related, and measured different aspect of the mathematics knowledge. This finding corroborates the finding of Onah (2019) that showed low value of correlation coefficient as an indicator of test construct validity. The standard error of measurement (SEM) associated with the b-parameter of each of the Two-tier Mathematics Diagnostic Test (TTMDT) item is used to estimate its reliability. All items had SE within the range of 0.1 and 0.3. Thus, it can be concluded that the TEST was adequate in measuring the TTMDT. This finding is in agreement with the studies conducted by Lengkong, Istiyono., Rampean, Rejeki, Tumanggor and Nirmala (2020), Ramli, Talib, Hassan and Manaf (2020) Kanwal, and Farooq (2021) and Aliyu (2015) that two-tier diagnostic test is valid and reliable to distinguish students who understand the concepts from those who misunderstood, and with the use of Rasch analysis two-tier test items could be improved upon by rewording items that showed anomalies base on the individual-item fit.

5.2 Students' Conceptual Understanding of Mathematics

The finding from the result in Table 4 showed that students have few right conceptions in all the 20 items of the mathematics concepts under investigation. Only 1 student of Upper Basic 1, 4 students of Upper Basic 2 and none of Upper Basic 3 students respectively had at least 40 percent (%) of the items answered correctly, (That is, these number of students, were found to hold right conception. answering correctly both tiers: content and reason parts). Furthermore, result in Table 5 showed that for all the items, 58.62% of the students responded correctly at the tier 1 level, whereas only 24.21% responded correctly at both tiers indicating that on average, 24.21% of students had understanding of the mathematics concepts. 34.41% who scored correct responses at the tier 1 level, either guessed the answer or only had partial knowledge that they used to achieve the correct responses while 17.17% students lack the knowledge of the mathematics concepts. Also, result in Table 5 revealed that percentage of students who answered correctly the content part was higher than the percentage of students who answered both tiers of the test. The mean difference between students' conceptual understanding (answering both tiers correctly) and their misconception (answering only content part) is 1.34 shown in Table 7 was significant as was confirmed in Table 15, indicating that students least understood the Mathematics concepts or lack understanding or have partial content knowledge. This may probably be because students may have memorized certain facts in mathematics knowledge without conceptual understanding (without knowing the how and why) This finding is in agreement with Onah (2019), Idehen and Omoifo (2015) and Likando and Ngoepe (2014) that the number of students holding correct conceptions of mathematics were fewer than the number holding misconceptions and the level of conceptual understanding of students in mathematics is weak which they attributed to their prior experience, preconceptions, cultural background, lower level or inadequate thinking and reasoning abilities which current teaching and assessment practices do not promote.

5.3 Gender Effects on Students' Level of Conceptual Understanding of Mathematics Knowledge

The result of the analysis in Table 6 showed that male and female students had a mean conceptual understanding score gain difference of 0.34. table 7, 8 and 9 also shows the comparism between male and female upper basic 1 with mean difference of 0.18, male and female upper basic 2 with mean difference of 0.55 and male and female upper basic 3 with mean difference of 0.21. However, these figures are considered small and confirmed in Table 16, 17 and 18 that the difference is not statistically significant with regard to mathematics knowledge under study. This implies that male and female students hold equal knowledge level as measured using two-tier diagnostic test. This finding can be related to the finding of Likando and Ngoepe (2014) who found that male and female students exhibit similar spatial ability in mathematics and hence performed similarly. This similarity in male and female students' understanding of mathematics knowledge may be as a result of their ability to mentally represent and manipulate objects in space and these skills predict better understanding.

6. Conclusion

Based on the findings of this study, the researcher concludes that two-tier diagnostic test indicate that this test could be used reliably and in a valid way to access students' conceptual understanding and identify the percentage of misconceptions of mathematics knowledge among upper basic students in Kogi state.

Furthermore, the use of two-tier mathematics diagnostic test (TTMDT) at any giving time of instruction helps a competent teacher to complete work perfectly in the class room. This is because when the students are aware that the underlying reasons for any answer is as important as the answer itself, more attention will be placed on it by the students themselves thereby promoting conceptual understanding of mathematics knowledge and misconception of mathematics knowledge will be eliminated. Also, students held more misconceptions in mathematics knowledge than their conceptual understanding signifying that students performed better when only first part of items of two-tier test (content part) was considered than when both parts of the items (content and reason parts) were considered. This is an indication that students have only partial knowledge of Mathematics knowledge without underlying reasoning. Gender was not significant in upper basic students' conceptual understanding of mathematics knowledge as assessed on TTMDT.

7. Recommendations

This study has shown that TTMDT is reliable and valid and can be used to assess students conceptual understanding and identified the percentages of misconceptions different from what is commonly used in achievement or teacher-made test which measured correct answer (content part) only. Based on these findings, the researcher recommends that:

Packages like Rasch model package, BILOG MG-3 and other similar packages should be made available to examination bodies and schools to analysis make their research works easily in the university libraries.

Teachers of mathematics should note the implication of misconceptions of mathematics knowledge and be encouraged to develop and use two-tier mathematics diagnose test in the process of teaching mathematics. This will help both the teacher and the students to identify such misconception and easy treatment.

The State Universal Basic Education Board (SUBEB) and Universal Basic Education board UBEC should initiate or support workshops, seminars and in-service training programmes aimed at giving serving teachers the opportunity to learn how to develop, interpret and use two-tier diagnostic tests these classes (schools) in helping them to use this type of testing to inform and improve mathematics teaching, thus learning.

The development and use of two-tier diagnostic tests should be incorporated in the mathematics and other subject curriculum for pre-service teachers. This will enable the teachers in training institutions prepare for challenges ahead of their teaching profession.

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Predatory Publishing and Research Integrity Crisis: Implications for Sustainable Educational Development in African Higher Education

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Abstract. Predatory publishing has become an increasingly worrying issue in contemporary academia, thereby raising serious concerns about research integrity and the sustainability of higher education, especially in Africa. This study explored the growing research integrity crisis that is associated with predatory publishing and examined its implications for sustainable educational development in African higher education institutions. The study adopted a systematic literature review and conceptual analysis approach, drawing from peer-reviewed journal articles, institutional reports, and policy documents published between 2020 and 2026. Guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework, relevant studies were identified, screened, and critically analysed to establish current trends, drivers, and consequences of predatory publishing practices within the environment of African higher education. The review revealed that intense pressure to publish, limited research funding, weak institutional monitoring systems, and inadequate awareness of predatory journals have contributed significantly to the increasing patronage of questionable publishers among scholars. The study further found that predatory publishing undermines academic credibility, weakens peer-review processes, reduces the quality of scholarly output, and negatively affects the global visibility of African research and researchers. Beyond its impact on individual researchers, the crisis poses broader challenges to educational quality, institutional reputation, and evidence-based policymaking. The study concludes that strengthening research ethics education, improving institutional regulatory frameworks, and promoting credible regional publishing platforms are essential for safeguarding research integrity and advancing sustainable educational development in African higher education.

Keywords: Predatory publishing; Research integrity; Sustainable educational development; African higher education; Academic ethics; Research quality and Higher education sustainability.

1. Introduction

The expansion of global academic publishing has significantly transformed the production and dissemination of knowledge across higher education institutions. Advances in digital technology, open-access publishing models, and international research collaborations have increased opportunities for scholars to share scientific findings and contribute to intellectual development globally. While this growth has improved research visibility and accessibility, it has also created vulnerabilities within scholarly communication systems, particularly through the emergence and proliferation of predatory journals, which now serve as a poison in the system of academia. Predatory publishing refers to deceptive publishing practices in which journals prioritize financial gain over rigorous peer review, editorial quality, and academic integrity. Recent studies have shown that the increasing commercialization of scholarly publishing continues to threaten the credibility of academic research and the trustworthiness of scientific knowledge production (Tomlinson, 2024; Mills et al., 2021).

The pressure to "publish or perish" has further intensified the challenges within the contemporary world of academics across various institutions in Africa, where promotion, tenure, research funding, and institutional ranking systems are strongly tied to publication output. Consequently, academics are increasingly compelled to publish rapidly, sometimes at the expense of research quality and ethical publishing standards, to keep up with the pressure. This pressure is well pronounced in developing regions where limited research funding, inadequate mentorship, and weak institutional regulatory frameworks are dominant and often expose scholars to questionable publishing outlets. Studies have observed that predatory publishers exploit these structural pressures by offering rapid publication processes, misleading indexing claims, and superficial peer-review systems to vulnerable authors (Tomlinson, 2024; Martinino et al., 2024).

Also, concerns surrounding research integrity have become increasingly significant in African higher education. Although African higher institutions continue to contribute meaningfully to global scholarship, the growing presence of predatory journals threatens the quality, credibility, and international visibility of research outputs from the continent. Existing literature suggests that inadequate awareness of predatory publishing practices, combined with institutional pressure for the productivity of academics, has contributed to the patronage of questionable journals among some scholars in African higher institutions (Jingura et al., 2025). The consequences extend beyond individual researchers, affecting institutional reputation, policy credibility, public trust in academic research, and the broader sustainability of higher education systems.

Research integrity remains another integral instrument that ensures sustainable educational development because credible scholarship informs evidence-based policymaking, innovation, teaching quality, and national development strategies. However, predatory publishing undermines these objectives by encouraging the dissemination of poorly reviewed or unreliable studies. The continuous increase in the commercialization of academic publishing and the weakening of peer-review standards have therefore generated what many scholars now describe as a research integrity crisis within global higher education systems (Mills et al,2025). In Africa, where higher education institutions are already being faced with challenges such as underfunding, inadequate infrastructure, and global competitiveness, the persistence of unethical publishing practices poses additional threats to sustainable educational development in the region.

Despite increasing global attention to predatory publishing, limited studies have critically examined its implications for sustainable educational development within the context of African higher education. Much of the existing scholarship focuses on the identification of predatory journals, with less attention given to their broader institutional and developmental consequences. This gap necessitates a more comprehensive understanding of how predatory publishing contributes to the research integrity crisis and undermines sustainable higher education development across Africa. Against this background, this study examined predatory publishing and the growing research integrity crisis in African higher institutions, with particular attention to their implications for sustainable educational development.

1.1 Statement of the Problem

The increasing growth of academic publishing has expanded opportunities for knowledge sharing, research collaboration, and global scholarly visibility. However, this expansion has also encouraged the rapid spread of predatory journals that prioritize financial profit above research quality and academic integrity. Predatory publishers often attract researchers through promises of fast publication, weak or non-existent peer-review processes, fake indexing claims, and misleading impact metrics. These practices have raised serious concerns about the credibility and reliability of scholarly outputs within higher education institutions globally. In African higher education, the problem has become increasingly significant due to growing pressure on academics to publish for promotion, tenure, institutional ranking, and career advancement. In many African higher institutions, publication output is frequently emphasized more than research quality, creating conditions that push some scholars toward questionable publishing outlets. Limited research funding, inadequate mentorship, weak institutional monitoring systems, and insufficient awareness of predatory publishing further increase the vulnerability of academics to deceptive journals.

The commercialization of scholarly publishing has also contributed to the problem by transforming academic publishing into a highly competitive and profit-driven enterprise. As publication charges continue to rise and pressure to publish intensifies, some publishers exploit the desperation of researchers by offering rapid acceptance and minimal editorial scrutiny. Consequently, weak peer-review standards

and the circulation of poorly vetted studies continue to threaten research integrity across higher education institutions. The consequences for African higher institutions are substantial. Predatory publishing undermines academic credibility, weakens the quality of research outputs, damages institutional reputation, and reduces the global visibility of African scholarship. It also affects evidence-based policymaking, teaching quality, and sustainable educational development by promoting unreliable and poorly reviewed knowledge. Despite growing global discussions on predatory publishing, existing studies have focused largely on identifying predatory journals and their operational practices. Limited attention has been given to how predatory publishing affects sustainable educational development within African higher education systems. This study, therefore, addresses this gap by examining the relationship between predatory publishing, research integrity crisis, and sustainable educational development in African higher education.

1.2 Objectives of the Study

Precisely, the study sought to:

- examine the drivers of predatory publishing in African higher institutions.
- analyse the relationship between predatory publishing and the research integrity crisis.
- investigate the implications of predatory publishing for sustainable educational development; and
- propose strategies for strengthening ethical scholarly publishing practices in African higher education institutions.

1.3 Research Questions

The following research questions were raised to guide the study:

- What factors encourage predatory publishing in African higher institutions?
- How does predatory publishing contribute to the research integrity crisis in African higher institutions?
- What are the implications of predatory publishing for sustainable educational development?
- What measures can strengthen research integrity and ethical publishing practices in African higher education institutions?

This study is significant because it contributes to ongoing scholarly debates on research ethics, academic credibility, and sustainable higher education development in Africa. The study further provides useful insights for policymakers, higher institution administrators, researchers, and quality assurance agencies seeking to strengthen institutional research integrity frameworks and promote credible scholarly communication systems across African higher education institutions.

2. Conceptual Clarifications

2.1 Predatory Publishing

Predatory publishing refers to unethical academic publishing practices in which publishers prioritize financial profit over research quality, editorial standards, and credible peer-review processes. These journals often attract researchers through unsolicited emails, promises of rapid publication, misleading impact factors, and false claims of indexing in reputable databases. In many cases, manuscripts are accepted with little or no rigorous review, thereby compromising the quality and credibility of published research (Tomlinson, 2024). The growth of predatory publishing has been linked to the increasing commercialization of scholarly communication and the pressure on academics to publish frequently for promotion, career advancement, and institutional recognition. While digital publishing and open-access models have improved access to knowledge globally, they have also created opportunities for exploitative publishers to operate with minimal accountability. In Africa, limited awareness of predatory journals, inadequate mentorship, and weak institutional monitoring systems have further increased the vulnerability of researchers to deceptive publishing outlets (Mills et al., 2021). As a result, predatory publishing has become a major concern for the credibility of research and the integrity of higher education systems.

2.2 Research Integrity

Research integrity refers to the commitment to honesty, transparency, accountability, and ethical conduct throughout the research process. It involves ensuring that research is conducted, reported, and published in ways that uphold academic standards and public trust. Research integrity covers issues such as proper data management, ethical authorship practices, accurate reporting of findings, avoidance of plagiarism, and adherence to credible peer-review procedures (UNESCO, 2021). In higher education, research integrity is essential because higher institutions depend on credible scholarship to support teaching, innovation, policymaking, and societal

development. However, the increasing spread of predatory journals has raised concerns about weakened peer-review systems, poor editorial practices, and the circulation of unreliable research findings. The growing emphasis on publication output and institutional ranking has also contributed to what many scholars describe as a research integrity crisis within contemporary academia (Mills et al, 2025). Protecting research integrity, therefore, remains critical to maintaining academic credibility and sustaining confidence in higher education institutions.

2.3 Sustainable Educational Development

Sustainable educational development refers to the continuous improvement of educational systems in ways that promote quality learning, credible knowledge production, institutional effectiveness, and long-term social development. The concept is closely associated with Sustainable Development Goal 4, which emphasizes inclusive and quality education as a foundation for sustainable societies (UNESCO, 2025). In higher education, sustainable educational development goes beyond increasing access to higher institutions. It also involves strengthening research quality, promoting ethical scholarship, supporting innovation, and ensuring that academic institutions contribute meaningfully to national and global development (Adelakun, 2020). Sustainable educational development depends largely on the integrity and reliability of academic research because higher institutions play a central role in generating knowledge that informs public policy, economic growth, and social transformation. Consequently, the spread of predatory publishing threatens sustainable educational development by encouraging low-quality research, weakening public trust in scholarship, and undermining the global credibility of academic institutions.

2.4 Higher Education Sustainability

Higher education sustainability refers to the ability of universities and other tertiary institutions to maintain quality teaching, ethical research practices, institutional relevance, and long-term academic competitiveness. Sustainable higher education systems are expected to support responsible knowledge production, innovation, social responsibility, and continuous institutional development (Ankareddy, 2025; Adelakun & Olorunsola, 2024). In the African context, higher education sustainability is influenced by several factors, including research funding, policy support, institutional governance, academic capacity, and international research visibility. The increasing patronage of predatory journals poses a serious challenge to this sustainability because it weakens research quality, damages institutional reputation, and reduces confidence in African scholarship within the global academic community. As African higher institutions continue to compete for recognition, funding, and international collaboration, maintaining credible publishing practices and strong research ethics becomes essential for sustaining higher education development across Africa.

2.5 Theoretical Underpinning

This study is based on Institutional Theory, which explains how institutions influence the behaviour, decisions, and practices of individuals and organizations through established rules, norms, expectations, and reward systems. The theory indicates that people and institutions often act in ways that align with accepted professional standards and organizational pressures to gain legitimacy, recognition, and survival within their environments (Suddaby, 2013). In higher education, African institutions and academics operate within systems where research productivity, publication output, institutional ranking, and funding opportunities are increasingly used to measure academic success.

Institutional Theory is relevant to this study because it helps explain why some academics publish in predatory journals despite growing awareness of unethical publishing practices. In many African institutions, promotion, tenure, research grants, and professional recognition are strongly linked to the number of publications produced by academic staff. As a result, scholars often face significant pressure to publish within limited timeframes. This “publish or perish” culture has fostered an environment where rapid publication is sometimes valued over research quality, originality, and ethical standards. In such conditions, some researchers may resort to predatory journals that promise quick publication with little or no rigorous peer review (Mills et al., 2021).

The theory also clarifies how institutional and structural challenges within African higher education contribute to the growing research integrity crisis. Factors such as limited research funding, weak mentorship systems, restricted access to reputable journals, and inadequate institutional oversight can increase researchers’ vulnerability to deceptive publishers. In the pursuit of global visibility and institutional competitiveness, higher institutions often promote increased publication output to improve rankings and research profiles. While these expectations aim to strengthen academic productivity,

they can unintentionally create situations that encourage unethical publishing behaviour. Institutional Theory further emphasizes the importance of legitimacy in organizational systems. African higher institutions seek credibility through measurable research achievements, citations, collaborations, and international recognition. However, when institutional success is mainly judged by publication numbers rather than the quality and impact of research, ethical scholarly practices may be compromised. Predatory publishers exploit this pressure by offering fast publication processes, false claims of indexing, and minimal editorial scrutiny to attract researchers seeking academic advancement (Tomlinson, 2024).

In the context of this study, Institutional Theory offers a useful framework to understand predatory publishing as more than an individual ethical failure. It highlights how institutional expectations, evaluation systems, and competitive academic environments influence researchers' publishing decisions and contribute to weakened research integrity. Therefore, the theory underscores the need for higher institutions and regulatory bodies to strengthen research ethics policies, improve quality assurance systems, and develop promotion criteria that value credible and impactful scholarship over publication quantity alone. Addressing these institutional pressures is essential for safeguarding research integrity and supporting sustainable educational development in African higher education.

3. Literature Review

3.1 Evolution of Predatory Publishing

The growth of digital technology and open-access publishing has transformed scholarly communication by increasing global access to research and reducing publication limitations. While these developments have improved knowledge dissemination, they have also contributed to the proliferation of predatory publishing. Predatory journals operate primarily for financial profit and often disregard accepted academic standards such as rigorous peer review, editorial transparency, and research ethics. Recent studies indicate that predatory publishers exploit the open-access model by charging publication fees while providing little or no quality control (Tomlinson, 2024; Mills et al., 2021). Over time, predatory publishing has evolved from isolated deceptive practices into a global challenge affecting African higher institutions, researchers, and academic institutions across different regions. Advances in online publishing platforms have allowed predatory journals to imitate legitimate academic outlets through fake impact factors, fabricated editorial boards, and misleading indexing claims. The increasing sophistication of these practices has made it more difficult for inexperienced researchers to distinguish between credible and deceptive journals (Shen & Shah, 2023; Wali et al, 2025).

3.2 Publish-or-Perish Syndrome

The "publish or perish" culture has become one of the major drivers of predatory publishing within contemporary academia. Higher institutions increasingly rely on publication output as a key criterion for promotion, tenure, funding opportunities, and institutional ranking. In order to meet these requirements to ensure their job security, academics often face intense pressure to publish regularly, sometimes within unrealistic timelines. This pressure has created conditions where the quantity of publications is frequently prioritized over research quality and societal relevance. Recent literature suggests that excessive emphasis on publication metrics has contributed to the growing patronage of predatory journals, especially among early-career researchers and academics in developing countries (Mills et al., 2021; Macháček & Srholec, 2021). The promise of rapid publication and minimal editorial scrutiny offered by predatory publishers becomes attractive to scholars struggling to meet institutional performance expectations. In many African higher institutions, where promotion and career progression are strongly linked to publication records, the pressure to publish continues to expose academics to unethical publishing outlets.

3.3 Academic Corruption and Fake Peer Review

Peer review remains one of the most important mechanisms for ensuring research quality and academic credibility. However, the spread of predatory publishing has weakened confidence in the integrity of the peer-review process. Many predatory journals claim to conduct peer review with the bait of accepting manuscripts within a few days or even hours without meaningful editorial assessment before publication. In some cases, fake reviewers, fabricated editorial boards, and manipulated review systems are used to create the appearance of legitimacy (Wittau & Seifert, 2024). The weakening of peer-review standards contributes to broader concerns about academic corruption and unethical scholarly practices. Studies have shown that compromised peer-review systems increase the circulation of poorly conducted or misleading research, thereby undermining public trust in academic scholarship (Mills et al, 2025). Beyond individual misconduct, the problem reflects systemic challenges within higher education where institutional

pressures and commercialization increasingly influence scholarly communication.

3.4 Predatory Journals in Africa

The problem of predatory publishing has become increasingly visible across African higher education institutions. Although African scholars continue to contribute significantly to global knowledge production, limited research funding, inadequate mentorship, and weak institutional regulatory systems have increased researchers' vulnerability to deceptive publishing outlets. Studies have reported growing concerns about the publication of African scholarship in predatory journals, particularly among early-career academics seeking promotion and professional recognition (Jingura et al., 2025). In corroboration, Mills et al. (2021) observed that the African research ecosystem faces unique structural challenges, including limited access to reputable journals, publication costs, and global inequalities in scholarly publishing. These conditions often create opportunities for predatory publishers to target researchers from developing regions. Consequently, the credibility and international visibility of African scholarship may be weakened by the growing circulation of research published in questionable outlets.

3.5 Effects on Educational Quality

Predatory publishing has serious implications for educational quality and the credibility of higher education systems. African higher learning institutions depend on reliable and well-reviewed research to support teaching, curriculum development, innovation, and policymaking. However, when poorly reviewed or unreliable studies are widely circulated through predatory journals, the quality of academic knowledge and evidence-based decision-making becomes compromised (Pulido, 2025; Santos et al, 2026). Recent studies suggest that predatory publishing weakens research standards, damages institutional reputation, and reduces public trust in academic institutions (Zhakata & Gwede, 2026; Tomlinson, 2024). In higher education, this may affect teaching quality, graduate training, and the ability of higher institutions to contribute meaningfully to social and economic development. The long-term effect is a weakened educational system where questionable research outputs increasingly influence academic discourse and institutional evaluation.

3.6 Globalization and Commercialization of Scholarship

Globalization has expanded opportunities for international research collaboration, academic networking, and knowledge dissemination. At the same time, it has contributed to the commercialization of scholarly publishing. Academic publishing has increasingly become a competitive global industry where publication output, citations, and journal rankings are closely tied to institutional prestige and financial investment (Bayanbayeva, 2026; Shrestha, 2020). The commercialization of scholarship has created a publishing environment in which financial interests sometimes overshadow academic quality and ethical responsibility. Mills et al (2025) argued that the growing emphasis on revenue generation within academic publishing poses significant risks to research integrity and scholarly credibility. Predatory publishers exploit this environment by offering fast publication services and presenting themselves as legitimate scholarly outlets. As competition for academic visibility increases globally, researchers in resource-constrained institutions remain particularly vulnerable to exploitative publishing practices.

3.7 Research Integrity and Knowledge Production

Research integrity is fundamental to credible knowledge production and sustainable higher education development. African Higher institutions rely on ethical research practices to generate reliable knowledge that can inform teaching, innovation, public policy, and societal progress. However, predatory publishing threatens research integrity by encouraging the dissemination of low-quality, poorly reviewed, or misleading studies. The growing research integrity crisis has raised concerns about the reliability of academic knowledge within global higher education systems. UNESCO (2021) emphasized that ethical scholarship, transparency, accountability, and rigorous peer review are essential for maintaining public trust in scientific research. When predatory publishing weakens these standards, the credibility of knowledge production becomes compromised. In African higher education, protecting research integrity is particularly important because African higher institutions play a central role in addressing developmental challenges through research, innovation, and evidence-based policymaking.

4. Research Methodology

This study adopted a conceptual and systematic literature review approach to examine the growing problem of predatory publishing and its implications

for research integrity and sustainable educational development in African higher education. The approach was considered suitable because the study relied on existing scholarly evidence to provide a broad and critical understanding of the subject. Rather than generating primary data through surveys or interviews, the study adopts the use of secondary data to synthesize current knowledge, identify major patterns in the literature, and examine how previous studies have discussed predatory publishing within higher education systems.

The review process was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework developed by Page et al. (2021). The PRISMA approach provides a transparent and organized procedure for identifying, screening, selecting, and reviewing relevant literature in systematic review studies. The framework was adopted to ensure consistency, credibility, and clarity throughout the review process. Relevant materials were obtained from reputable academic databases, including Scopus, Web of Science, Google Scholar, ScienceDirect, and Taylor & Francis Online. The search focused mainly on peer-reviewed journal articles, institutional publications, conference papers, and policy documents published between 2021 and 2026. To retrieve relevant studies, keywords such as "predatory publishing," "research integrity," "publish or perish," "fake peer review," "academic publishing ethics," "sustainable educational development," and "African higher education" were used as search terms during the search process.

Clear inclusion and exclusion criteria were applied to maintain the quality and relevance of the review. Only English-language studies that directly addressed predatory publishing, research integrity, unethical scholarly practices, or sustainable higher education development were included. Publications that were duplicated, unrelated to the objectives of the study, outside the selected timeframe, or lacking scholarly credibility were excluded from the review. Document analysis served as the primary method of data analysis. The selected studies were carefully examined and organized into major themes based on the objectives of the study. Through thematic analysis, the review identified recurring issues such as pressure to publish, weak peer-review systems, fake indexing claims, commercialization of academic publishing, and the effects of predatory journals on educational quality and institutional credibility. The conceptual review also made it possible to connect these issues to broader concerns about research integrity and sustainable development within African higher education.

The use of systematic review and conceptual analysis strengthened the study by allowing evidence to be drawn from diverse scholarly sources and recent literature. This approach also provided a deeper understanding of the institutional and structural conditions that continue to encourage predatory publishing practices across higher education institutions in Africa.

5. Discussion

Research Question One: What factors encourage predatory publishing in African higher institutions?

Findings:

The findings of this study show that predatory publishing has become a serious challenge to research integrity and sustainable educational development in African higher education. Although academic publishing remains an important measure of scholarly productivity and institutional growth, the increasing pressure on academics to publish has created conditions that encourage continuous engagement with questionable journals. In many cases, researchers are expected to publish frequently for promotion, career advancement, institutional ranking, and access to research opportunities. This pressure has contributed to the growing patronage of predatory journals that promise rapid publication with little or no rigorous peer review.

Research Question Two: How does predatory publishing contribute to the research integrity crisis in African higher institutions?

Findings:

One of the major concerns associated with predatory publishing is its effect on academic credibility. African higher institutions are expected to produce reliable knowledge that can support teaching, innovation, and societal development. However, when research is published in journals that lack proper editorial standards and credible peer-review processes, the quality and trustworthiness of such research become questionable. Predatory journals often prioritize financial profit above scholarly quality, thereby allowing poorly reviewed or misleading studies to enter academic circulation (Chatio et al, 2024; Tomlinson, 2024). This weakens confidence in academic research and affects the credibility of both individual researchers and higher education institutions.

Research Question Three: What are the implications of predatory publishing for sustainable educational development?

Findings:

The study further reveals that predatory publishing can negatively affect higher institutions' rankings and institutional reputation. Globally, higher institutions are increasingly evaluated based on research quality, citation impact, international visibility, and scholarly reputation. Publications in predatory journals rarely receive meaningful academic recognition because many of these journals are not indexed in reputable databases and often lack the research credibility that they claim. As a result, institutions associated with questionable publishing practices may experience reduced global visibility, weaker academic partnerships, and lower competitiveness within international higher education systems. Mills et al. (2021) noted that the growing circulation of research through predatory journals continues to affect the international perception of African scholarship.

Another important issue identified in this study is the influence of predatory publishing on policy decisions and knowledge-based development. Governments, institutions, and policymakers rely heavily on academic research when formulating policies relating to education, health, economic development, and social welfare. When unreliable or poorly reviewed studies become part of academic literature, the quality of evidence available for policymaking becomes compromised. This may result in weak or ineffective policy decisions that fail to address societal challenges adequately. In developing regions, where research is expected to contribute directly to national development, compromised scholarship can have long-term consequences for institutional planning and public trust in higher education.

The findings also indicate that predatory publishing reduces educational quality within African higher institutions. Credible research plays an indispensable role in curriculum development, teaching effectiveness, graduate training, and innovation. However, the increasing availability of low-quality research published through predatory journals threatens academic standards and weakens the culture of critical scholarship within higher education institutions. Students and researchers who rely on unreliable studies may unknowingly reproduce wrong information, thereby affecting the overall quality of learning and research outcomes. The continued weakening of peer-review standards and editorial quality, therefore, contributes significantly to the broader research integrity crisis facing the contemporary academic world (Mills et al, 2025; Amutuhaire, 2022).

The study further shows that predatory publishing poses a direct threat to sustainable educational development and the realization of Sustainable Development Goal 4 (Quality Education), which emphasizes inclusive, equitable, and quality education for sustainable development (UNESCO, 2025). Sustainable educational development depends on credible research, ethical scholarship, innovation, and institutional accountability. However, when academic systems become dominated by unethical publishing practices, unreliable and irrelevant research outputs, the ability of African higher institutions to contribute meaningfully to social and economic development of the world becomes weakened. In the African context, where higher education institutions are already faced with challenges relating to funding, infrastructure, and research capacity, the spread of predatory publishing creates additional limitations to the achievement of sustainable growth and global academic competitiveness.

Research Question Four: What measures can strengthen research integrity and ethical publishing practices in African higher education institutions

Findings:

The discussion also reinforces the relevance of Institutional Theory in understanding the persistence of predatory publishing within higher education systems. Institutional pressures linked to publication targets, promotion requirements, funding opportunities, and higher institutions' ranking often shape researchers' publishing decisions. In environments where publication quantity and numbers are prioritized more than research quality, some academics may feel compelled to choose rapid publication regardless of journal credibility. This suggests that predatory publishing is not only an individual ethical problem but also a reflection of broader institutional and structural challenges within higher education. Addressing the problem, therefore, requires stronger institutional policies, improved research ethics education, effective quality assurance systems, and balanced research evaluation frameworks that place greater value on credible and impactful scholarship.

6. Conclusion

Predatory publishing has become a growing concern within African higher education and it has continued

to pose serious challenges to research integrity, academic credibility, and sustainable educational development. The study revealed that increasing pressure on academics to publish for promotion, career advancement, institutional ranking, funding opportunities, and publish-or-perish syndromes has contributed significantly to the increase in patronage of predatory journals. At the same time, weak institutional monitoring systems, poor awareness of credible publishing platforms, fake indexing claims, and the commercialization of scholarly publishing have created conditions that allow unethical publishing practices to thrive.

The study further revealed that the effects of predatory publishing extend beyond individual researchers to affect higher institutions and the wider educational system. The publication of poorly reviewed and unreliable studies weakens confidence in academic research, damages institutional reputation, reduces the global visibility of African scholarship, and affects the credibility of evidence used for policymaking and development planning. The growing spread of questionable research outputs also threatens educational quality by weakening research standards, teaching, innovation, and knowledge production within higher education institutions.

The findings equally suggest that predatory publishing represents not only an ethical problem but also a structural challenge within contemporary academia. The excessive emphasis placed on publication quantity rather than research quality has encouraged a culture in which rapid publication is sometimes prioritized above credible and impactful scholarship. This situation continues to weaken research integrity and the role of African higher institutions in reliable knowledge and societal development. The study, therefore, stresses the urgency of reforming African higher education systems by strengthening research ethics education, improving institutional quality assurance mechanisms, supporting credible regional journals, and sensitizing/awareness programmes of reputable indexing systems as necessary steps toward addressing the crisis. African higher institutions and regulatory bodies must also adopt balanced promotion and research evaluation systems that place greater value on research quality, originality, and societal relevance rather than the number of publications alone.

Finally, sustainable educational development cannot be achieved without credible research and ethical scholarly practices. Protecting research integrity is therefore essential to strengthening higher education institutions and advancing the realization of Sustainable Development Goal 4 (Quality Education), which promotes inclusive, equitable, and quality education for sustainable development. (UNESCO, 2025). African higher institutions must therefore continue to strengthen ethical publishing culture and institutional accountability to sustain credible knowledge production and meaningful educational development on the continent.

7. Recommendations

Based on the findings of this study, there is a clear need for stronger and more coordinated efforts to address predatory publishing and protect research integrity within African higher education. The following recommendations are therefore proposed:

African higher institutions and regulatory bodies should strengthen institutional policies relating to research ethics and scholarly publishing. Many institutions still lack clear and enforceable guidelines on acceptable publishing practices. Developing comprehensive policies that clearly define predatory publishing and outline standards for credible scholarly communication would help guide researchers toward ethical publishing decisions. Institutions should also strengthen internal quality assurance systems to monitor publication practices more effectively.

Research ethics and academic publishing training should become a regular and compulsory part of academic development programs for staff and postgraduate students. Many researchers, particularly early-career academics, are often exposed to predatory journals because of limited awareness and inadequate mentorship. Continuous training on peer review, credible indexing systems, journal selection, citation practices, and publication ethics would help researchers make informed publishing decisions and reduce vulnerability to deceptive publishers.

African higher institutions should intensify awareness programs on predatory publishing and unethical scholarly practices. Academic institutions can organize seminars, workshops, and awareness campaigns that educate researchers on how to identify fake impact factors, misleading indexing claims, suspicious editorial practices, and weak peer-review systems. Access to updated information about reputable journals and recognized indexing databases would further support ethical publishing practices within African higher institutions.

There is an urgent need to reform promotion and research evaluation systems in many African higher education institutions. The excessive emphasis placed

on publication quantity has contributed significantly to the "publish or perish" culture that drives some academics toward questionable journals. Promotion criteria should therefore focus more on research quality, originality, societal impact, innovation, and contribution to knowledge rather than the number of publications alone. Such reforms would encourage responsible scholarship and reduce pressure for rapid publication.

African higher institutions, regulatory agencies, and professional academic bodies should collaborate to identify and blacklist predatory journals and publishers. Publicly available and regularly updated lists of questionable journals would help researchers avoid deceptive publishing outlets and strengthen institutional efforts toward maintaining academic standards.

African governments and African higher institutions should invest more in strengthening credible African academic journals. Many reputable local journals struggle with limited funding, inadequate visibility, and weak publishing infrastructure. Providing financial support, editorial training, digital publishing systems, and opportunities for international indexing would improve the quality and visibility of African scholarship. Strong regional journals can provide researchers with credible and accessible publication platforms while promoting ethical scholarly communication across the continent.

Stronger regional and international research collaborations should be encouraged among African higher institutions and scholars. Collaborative networks can improve mentorship, research quality, funding access, and knowledge sharing while promoting a stronger culture of research integrity. Partnerships among institutions may also support the development of common standards and policies for ethical publishing practices across African higher education systems. Addressing predatory publishing requires collective responsibility from African higher institutions, governments, researchers, and regulatory agencies. Strengthening ethical research culture and institutional accountability remains essential for protecting academic credibility and advancing sustainable educational development in Africa.

8. Explanation of the PRISMA Process used in the Study

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework was adopted to ensure transparency and consistency in the selection of the literature process. Relevant studies were identified from major academic databases, including Scopus, Web of Science, Google Scholar, ScienceDirect, and Taylor & Francis Online. A total of 218 records were initially retrieved. After removing 109 duplicate studies, 109 studies were left for title and abstract screening. 31 studies that were not directly related to predatory publishing, research integrity, sustainable educational development, or African higher education were excluded at this stage. Following the screening process, 78 full-text articles were assessed for eligibility. Further exclusions were made based on relevance, methodological quality, and publication timeframe. Finally, 23 studies met the inclusion criteria and were included in the qualitative synthesis for the study. These were done in compliance with PRISMA 2020.

8.1 PRISMA Flow Table for Systematic Literature Review

S/N	Activities	Number of Studies
	Identification of studies through databases and other sources. Records identified through database searching in Scopus, Web of Science, Google Scholar, ScienceDirect, and Taylor & Francis Online	Total studies 218
	Duplicate studies removed	109
	Studies screened by title and abstract	109
	Studies excluded after screening Reasons: Irrelevant topic, Outside study scope, and non-peer-reviewed sources	31
	Full-text articles assessed for eligibility	78
	Full-text articles excluded Reasons: Methodological limitations, Insufficient relevance, and Outside publication timeframe	55
	Final studies included in the qualitative synthesis	23

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The Role of Information and Communication Technology (ICT) in Teachers Education for Sustainable Development in Nigeria

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Abstract. This paper discussed the place of Information Communication Technology (ICT) in teacher education for sustainable development in Nigeria. The main argument here is that the ICT environment in Nigeria needs to be enriched to ensure the training and development of teachers that are able to blend with the changing demands of teaching in the present era of globalisation with its emphasis on Information Communication Technology (ICT). The main critical issues identified as needing policy intervention here are teacher Information Communication Technology (ICT) access and competence. Some of the advantages of Information Communication Technology (ICT) on education for sustainable development are highly spelt out. The paper recommends enhancement of teacher access and competence through curriculum adaptation that will involve theoretical and practical exposures in Information Communication Technology (ICT) as part of teacher education programme and provision of access to computer and other ICT infrastructure to teachers on the field.

Keywords: Information and Communication Technology, Teacher Education, Sustainable Development, Globalisation.

1. Introduction

Information and Communication Technology (ICT) has become a house-hold concept all over the world. In Nigeria, under star, ling and mastering of basic skills and concepts of ICT form part of the core of schools at various levels. It might be construed that ICT generally refers to computers and computing related activities. This is, however, not the case because even for the fact that computer and their applications play important role in modern information management, other technologies or system also comprises the phenomenon that is commonly regarded as ICT.

UNESCO (2017) regards Information and Communication Technology (ICT) as the combination of information technology with other related technology, specifically communication technology. Informatics refers to the science dealing with the design, realisation. Evaluation, use and maintenance of information process systems which include hardware, software organisational and human aspect. An implication of this information technology on the other hand is defined as the technological application (artefacts) of informatics in society. This paper is aimed at examining the role of ICT in Nigeria teacher education system, advantages of ICT in education for sustainable development, teacher's education and ICT., the impact of ICT on teachers/students, the use of E-learning in education, challenges it also discuss in ICT in education, recommendations and conclusion. Information Communication Technology highly depends on manpower training, instruments, power supply/energy. Utilization which will lead to sustainable development.

2. The Relevance of ICT in Education

The communication revolution has had tremendous implications for education because education involves both medium and message of the communication process. ICT in education means the use of computer and different applications of ICT in instruction as well as information transmission and exchange via the World Wide Web to enhance cognitive development. Through the application of information and communication technology in education, motivation is ensured because it helps in the recall of previous learning, providing new instructional stimuli and activating the leaner's response like power point presentation in seminars. This also provides systematic and steady feedback. ICT facilitates appropriate practice sequencing learning and acts as a viable source of information for enhanced learning. As people become aware of the development around them, there is every tendency to improve the same in Nigeria. By using this innovative, instructional strategy, learners would be able to nurture and sustain desirable attitude towards information technology tools in their entire life. The chosen medium of communication influences the distribution of knowledge over time and space. The technology involved in communicating has been linked to learning throughout history.

The uses of information and communication technologies in the education process are divided into categories. According to Okebukola (2016), the categories are ICT for education and ICT in education. By ICT for education, he means the development of information and communication technologies in the teaching-learning process, and by 1.C.T. in education he means the utilization of information and communication technology in teaching-learning process.

Thomas and Raga (2014) classify the application of computers and other communication technologies in education into three categories: Pedagogy: Training and: Continuing education. Pedagogical application of ICT is concerned with the more effective learning with the and of various components of ICT. Explaining further on this concept or classification, the authors express optimism that almost all subjects ranging from the most structured Mathematics to the least structured music can be taught and learnt with the help of computers. It means that the application involves effective learning with the aid of computers and other information technologies serving the purpose of learning aids that play contemporary roles in teaching/learning situations rather than supplementary to the teacher/instruction/facilitator. Most people refer to computers as add-on rather than replacing devisor. Training refers to the development of skills. A skilled person is one who is well coordinated in psychomotor activity. In a simpler term, it refers to programmes that are concerned with improved ways of doing things, of carrying out various activities in a professional manner. Information communication and technology can be used to develop skill since it can provide programme that manifests its capacity for simulation model building and interactive adaption. This usage cuts across all courses and professions including administrative skills related to student management, tutoring, course writing and seminars.

The concept of continuing education is linked to society that is willing to learn but has been hampered by one factor or another which necessitates a break or gap in education not necessary as a result of mental incapability. By the dynamic nature of the contemporary society the end of formal education does not mean the end of learning. The rate at which changes come in the world demands the actualisation of the adage that learning is a continuous process which continues throughout one's life. One of the best tools to keep abreast with the world and sustain life long education is the use and application of information and telecommunication technology. Continuing education is based on past formal education and it assumes learner's to be adult or near adult who can manage their learning on their own. Apart from traditional technologies such as print, broadcast, television and radio, some other sophisticated new technologies provide opportunities for enhancing quality of teaching. These are audio tape, video tapes, computer-based planning packages, interactive video, CD, TV, audio teleconference and video conferencing. These technologies have been recently supplemented by the advent of opportunities for interactivity and access to instructional resources provided by the computer telecommunication network popularly known as internet. The delivery technologies package information and instruction to give student access to educational experiences.

According to UNESCO. (2013): The relevance of Information and Communication Technology (ICT) in education can be seen in various ways:

Improved access to information: With the internet and digital resources, students have access to a vast amount of information at their fingertips. This allows them to research and learn about topics in depth, beyond what is covered in textbooks. By using search engines and online databases, students can find up-to-date and reliable information to supplement their learning.

Enhancing communication and collaboration: ICT tools such as email, video conferencing, and messaging apps facilitate communication between students, teachers, and parents. Students can collaborate on projects with classmates in different locations, and teachers can provide feedback and support remotely. This improves the overall learning experience and fosters a sense of community among students and educators.

Personalized learning: ICT allows for personalized learning experiences tailored to individual student needs and learning styles. Educational software and platforms can adapt to each student's pace and level of understanding, providing targeted support and resources. This helps students to learn at their own pace and focus on areas where they need more help.

Engaging and interactive learning: ICT tools such as interactive whiteboards, educational apps, and simulations make learning more engaging and interactive for students. These tools can help students visualize complex concepts, conduct virtual experiments, and participate in virtual field trips. By making learning fun and interactive, ICT can improve student motivation and retention of information.

Global Perspectives: ICT enables students to connect with peers and experts from around the world, allowing them to gain global perspectives and cultural awareness. Through online collaborations and exchanges, students can learn about different cultures, languages, and viewpoints, enriching their educational experience and preparing them for a globalized world.

The relevance of ICT in education lies in its ability to enhance learning outcomes, improve access to information, facilitate communication and collaboration, personalize learning experiences, engage students, and provide global perspectives. By integrating ICT into the education system, teachers can create a more dynamic and student-centered learning environment that prepares students for the challenges of the 21st century.

3. Advantages of ICT in Education for Sustainable Development

With the integration of ICT in education there is every hope of industrial growth in the country, Industrialisation provides high output per man. This enhances growth of the economy and improves the living stand land of the citizen (Okebukola, 2016). The idea of depending on the national government for white collar job will be reduced with the introduction of information and communication technology in our educational system. This implies that information and communication technologies create opportunities for many enterprising individuals, firms and countries globally. The army of youths roaming the streets with all related criminal activities will be employed and crime waves will also be reduced. The emergence of GSM, commercial business centres, and cyber cafes, in the country has enhanced the economic fortune of families. The wasted human resources have been engaged in one form or the other, thereby encouraging research into the areas that can encourage foreign reserve.

Outside the socio-economic prosperity through ICT integration in education. teaching and learning will be improved in terms of their outcomes. It is, however. important to state that the use of this technology does not automatically enhance the quality of teaching and learning. Wali. (2018) asserts that in a situation where information and communication technology are efficient and effective and functional, they will relatively be used as teaching materials, easy data storage and processing as well as trial and simulation, easy documentation and follow up. It also provides easy access to information and external programmes as well as facilitate distance education. He stressed that when used and developed efficiently. it helps teachers teach more and better integrate learning. It brings together a large number of professionals who were apart in time and space. Despite the litany of the advantages of ICT in education for sustainable development, there are bound to be some shortcomings, such as low electricity supply, insufficient manpower, and insufficient computer instruments e.t.c.

Information and Communication Technology (ICT) plays a significant role in promoting sustainable development in education. By leveraging ICT tools and resources, educational institutions can address key challenges related to access to quality education, environmental sustainability, and social equity. The following advantages of using ICT in education for sustainable development:

Access to quality education: ICT provides students with access to digital learning resources, online courses, and educational platforms, regardless of their location. This helps bridge the gap between urban and rural areas, ensuring that all students have access to quality education and learning opportunities. For example, the use of online learning platforms such as Khan Academy and Coursers allows students to access high-quality educational content for free.

Environmental sustainability: ICT can contribute to environmental sustainability by reducing the need for

paper-based resources and minimizing the carbon footprint associated with traditional education practices. Digital textbooks, online assignments, and e-learning platforms help reduce paper waste and energy consumption, making education more eco-friendly. Additionally, virtual classrooms and webinars reduce the need for physical travel, thus reducing carbon emissions.

Enhancing teacher training and professional development: ICT tools can support teacher training and professional development by providing access to online courses, webinars, and resources. Teachers can expand their knowledge and skills in areas such as digital literacy, online teaching methods, and educational technology, empowering them to deliver high-quality instruction that promotes sustainability and environmental awareness.

Fostering collaboration and networking: ICT enables collaboration and networking among students, teachers, and educational institutions, fostering a culture of knowledge sharing and innovation. Online platforms, social media, and virtual communities allow stakeholders to connect, share resources, and collaborate on projects that promote sustainable development in education. For example, the Global Education Innovation Initiative (GEII) encourages collaboration among educators worldwide to promote sustainable development goals.

Promoting lifelong learning and continuous improvement: ICT supports lifelong learning and continuous improvement by providing access to online courses, webinars, and resources that help individuals enhance their knowledge and skills. By embracing digital learning opportunities, students and educators can stay current with evolving educational trends, technologies, and practices, thus contributing to sustainable development in education.

The advantages of using ICT in education for sustainable development are evident in its ability to provide access to quality education, promote environmental sustainability, enhance teacher training, foster collaboration, and support lifelong learning. By integrating ICT tools and resources into educational practices, institutions can create a more sustainable and inclusive learning environment that empowers students and educators to make positive contributions to society.

4. Teacher Education and ICT

ICT has changed the practice and philosophy of education, particularly teacher education and it is a powerful tool for the development of quality teaching and learning (Wali,2018).If the impact of ICT is to be felt in the lives of learners and the society at large, then teachers who are supposed to be "advocates of change" in the society must first be recipients of the current ICT revolution. According to Asuquo (2018), the environment in which the instruction is given simulates the working environment to the maximum possible degree. Teachers should be acquainted with technology (ICT) replica of the ones in the world of works and the ability to manipulate the ones in the world of works is a reflection of the skills acquired during training. The need to organise and manage content and teach it properly puts the teachers at the forefront of those that need ICT, because this is basically what ICT in education represents. For teachers to be very relevant and successful with respect to changing educational goals, then they must be abreast with proper means of disseminating and communicating with their students.

Basically, one of the goals of teacher education as contained in the National Policy for Education (2004) is to provide teachers with the intellectual and professional background adequate for their assignment and make them adaptable to any changing situations. But this is not the case, for instance, Iroha and Ekwueme (2004) observed that the extent of science teachers' awareness of ICT and utilisation are low, while Rubinson B. (2016) found that, majority of mathematics teachers are not computer skilled and may not be ready to use computer in implementation of mathematics curriculum. These findings reflect the level of inadequacy or lack of exposure to ICT in teacher training institutions. Teachers should therefore, be exposed to ICT in the course of their training in order to enhance productivity for quality education.

Ertmer, P. A. (2005). Enumerates some key aspects to consider when discussing teachers' education and ICT: Professional development for teachers: Teacher education programs should provide professional development opportunities for educators to enhance their ICT skills and digital literacy. Training workshops, online courses, and mentorship programs can help teachers develop proficiency in using educational technology tools, digital resources, and online platforms to support teaching and learning.

Integration of ICT in curriculum and pedagogy: Teacher education programs should emphasize the integration of ICT in curriculum design, lesson planning, and instructional strategies. Educators need to understand how to effectively incorporate digital tools, multimedia resources, and online activities to

enhance student engagement, foster critical thinking skills, and facilitate collaborative learning.

Digital assessment and feedback: Teachers should be trained in using ICT for assessment and feedback purposes, such as online quizzes, digital portfolios, and virtual assessments. By leveraging digital tools for assessment, teachers can gather and analyze student data, provide timely feedback, and track learning progress effectively.

Ethical and safe use of ICT: Teacher education programs should address ethical considerations, digital citizenship, and online safety guidelines to ensure that educators promote responsible and safe use of ICT in the classroom. Teachers need to understand the importance of protecting student privacy, preventing cyber bullying, and promoting digital literacy skills among their students.

5. The Impact of ICT on Teachers/Students

Information and Communication Technology (ICT) has a profound impact on both teachers and students in education. The integration of ICT tools and resources in teaching and learning can transform the way educators deliver instruction, engage students, and enhance learning outcomes. The impact of ICT on teachers and students can be seen in various aspects, including teaching effectiveness, student engagement, and skill development. According to Law, N., & Yuen, A. (2016). When discussing the impact of ICT on teachers and students:

Impact of ICT on Teachers: Professional development: ICT provides opportunities for continuous professional development for teachers, allowing them to enhance their digital literacy skills, learn new teaching strategies, and stay current with educational technology trends. Training workshops, online courses, and peer collaboration can help teachers improve their ICT competencies and integrate technology effectively in their teaching practices.

Instructional Support: ICT tools offer teachers valuable resources and support to design engaging and interactive lessons, create multimedia presentations, and deliver personalized instruction to meet the diverse learning needs of students. Digital platforms, educational software, and online resources enable teachers to provide differentiated instruction and address individual student interests and strengths.

Collaboration and Communication: ICT facilitates collaboration among teachers through online platforms, virtual communities, and professional networks, enabling them to share resources, exchange ideas, and collaborate on instructional projects. Communication tools such as email, messaging apps, and video conferencing enhance communication between teachers, students, and parents, fostering a collaborative learning environment.

6. Impact of ICT on Students

Engagement and motivation: ICT enhances student engagement and motivation by providing interactive learning experiences, multimedia content, and real-world applications of concepts. Digital tools such as educational apps, virtual simulations, and gamified learning platforms make learning fun and engaging, encouraging students to actively participate in their learning process.

Personalized learning: ICT enables personalized learning experiences tailored to students' individual needs, learning styles, and interests. Adaptive learning software, online assessments, and virtual tutoring programs help students progress at their own pace, receive targeted support, and explore areas of interest in depth.

Critical thinking and creativity: ICT fosters the development of critical thinking, problem-solving, and creative skills among students. By using digital tools to research, analyze information, and collaborate on projects, students develop analytical and creative thinking abilities that are essential for success in the digital age.

Digital literacy and 21st-century skills: ICT equips students with digital literacy skills, technological proficiency, and 21st-century competencies that are essential for their future success. By using ICT tools in their learning activities, students learn how to navigate digital resources, evaluate information sources, and communicate effectively in a digital world.

The use of ICT has had impact on the roles of both students and teachers. The teacher is no longer the dominant figure to teaching and learning process and the gap between teaching and learning is narrow and more precise. According to Voogt, J. (2017). These are some of the realities as a result of ICTs in education:

- Teachers will no longer be masters but colleagues.
- They are no longer custodians of knowledge and culture but guides and helpers.
- They help manage learning mot "give rules" on how to learn.

- The interactive nature of internet and the World Wide Web allows teachers and students to share knowledge and ideas. Thus, teachers and students become partners and learn from each other.
- Students will operate mostly independently.
- They will no longer be passive recipients of knowledge but active participants in what and how they learn.
- Students do not have to go to a classroom to learn. Instead, classroom learning will come to them in richer and better ways.

7. Use of E-Learning in Education

E-learning, also known as online learning or digital learning, has emerged as a popular and effective method of delivering education through digital technologies. E-learning offers students and educators the flexibility to access educational content and resources anytime, anywhere, using computers, mobile devices, and the internet. The use of e-learning in education has several advantages, including increased access to quality education, personalized learning experiences, and enhanced student engagement. According to Picciano, A. G. (2017). Here are some key points to consider when discussing the use of e-learning in education:

Access to quality education: E-learning provides students with access to high-quality educational content, online courses, and learning resources that may not be available in traditional classroom settings. By removing geographical barriers and time constraints, e-learning enables students to access educational opportunities from top institutions and experts worldwide, expanding their learning possibilities.

Personalized learning experiences: E-learning platforms allow for personalized learning experiences tailored to students' individual needs, interests, and learning styles. Adaptive learning algorithms, interactive multimedia content, and self-paced modules enable students to learn at their own pace, receive immediate feedback, and engage with content that aligns with their learning preferences.

Flexibility and convenience: E-learning offers flexible learning options that accommodate busy schedules, diverse learning styles, and varied commitments. Students can access course materials, participate in discussions, and complete assignments at their convenience, allowing for greater control over their learning process and promoting self-directed learning habits.

Enhanced student engagement: E-learning platforms enhance student engagement through interactive multimedia content, gamified learning activities, and collaborative online discussions. Features such as video lectures, virtual simulations, and online assessments make learning more engaging, interactive, and participatory, leading to increased student motivation and retention of course material.

E-Learning, according to Walli (2018), is the main ICT new education tool. E-learning or electronic learning is a new tool or instrument of teaching and learning. Wali (2018) opines that, e-learning is a form of learning that is provided electronically. It comprises the use of computers, telephones, satellites, internet and the World Wide Web. It could be provided partially or wholly via a web browser or through the internet or an intranet or through multimedia platforms such as CD-ROM or DVD. Waller and Wilson (2014) in their views, posited that e-learning is the effective learning process created by combining digitally delivered content with learning support and services. The use of e-leaning in education has a great impact on teachers/students. Harmonising these definitions and views, e-learning could be seen as a technology-based process/method of teaching and learning that involves the effective delivery of instruction through the use of ICT facilities, computers, telephones, multimedia internet, intranet and the World ny Wide Web; that is, an electronic means of delivering curriculum-based instructions which is comprehensive in content, presentation and purpose.

8. Challenges in ICT Education

The success of any educational programme depends on the calibre of teachers available to handle such programmes. According to Ebitimi (2016), our teachers did not have adequate training to the concept of pedagogy. The new learning technology and their uses. There is shortage of manpower for effective utilisation of software and their maintenance. This is to say that there are no enough qualified programme engineers and technicians and they are equally difficult to fund. When they are found, the (public) education cannot afford to retain as competition from the private sector is fierce.

Inyang- Abia (2017) enumerates some constraints facing ICT education to include the following:

- Dearth of qualified human resources
- Lack of enough political will and support by the government
- Lack of technical knowhow
- Inadequate supply of ICT equipment and devices
- Lack of constant energy or power supply;

- Lack of integration of ICT into education mainstream.

The epileptic nature of power supply in the country is another inhibition to effective use of technology in education. All information and communication technology are power driven. So, unless the bodies concern with power supply wake up from their slumber, the dream of information and communication technology will remain on paper and unfulfilled dream which is bad for the country. The information and communication technology equipment is costly implying that the electronic materials are not at the reach of many families in Nigeria. It means they require a hundred percent input of government at all levels ie. Federal. State and Local Governments to make the programme a reality. Also, identified as a shortcoming. is the problem of diversion of equipment. This is the manifestation of the indiscipline in our society. It is common knowledge that there was a lot of vandalisation, diversion and stealing of introductory technology equipment imported to this country at the wake of 6-3-3-4 system of education in the 1990s.

Nigeria as a nation is working towards belonging to the comity of nations that embrace ICT literacy. In view of this new dimension, it is a new experience for both teachers and students who are all going into the information communication technology as co-learners. The first challenge for the teachers in this circumstance is that they are faced with idea of creating a school or learning and teaching environment that is fundamentally different from what they experienced.

Information and Communication Technology (ICT) has transformed education by providing new tools and resources to enhance teaching and learning. However, the integration of ICT in education also poses several challenges that educators and institutions need to address. Understanding these challenges is essential to developing effective strategies for maximizing the benefits of ICT in educational settings. Here are some key challenges of ICT in education:

Inyang- Abia (2017) enumerates some challenges facing ICT in education to include the following:

Access and infrastructure: One of the primary challenges of ICT in education is the unequal access to technology and reliable internet connectivity among students and schools. Disparities in access to digital devices, software programs, and high-speed internet may limit students' ability to fully engage with online resources and participate in digital learning activities.

Digital literacy and training: Many educators may lack the necessary digital literacy skills and training to effectively integrate ICT tools into their teaching practices. Without sufficient training and professional development opportunities, teachers may struggle to incorporate technology into their lessons, assess digital resources, and provide meaningful support to students in using digital tools.

Technological barriers and compatibility issues: Educational institutions often face challenges related to the compatibility of ICT systems, software applications, and digital resources. Inconsistent technology standards, interoperability issues, and software incompatibilities may hinder the seamless integration of ICT in curriculum delivery and communication between stakeholders.

Digital divide and equity concerns: The digital divide refers to the gap between individuals and communities who have access to technology and those who do not. In educational settings, the digital divide can exacerbate existing inequities in access to educational opportunities, resources, and learning outcomes, particularly for underserved populations and marginalized groups.

In addressing these challenges, educators, policymakers, and technology providers need to collaborate to develop comprehensive strategies for promoting equitable access to ICT, enhancing digital literacy skills, ensuring data security, and mitigating the impact of the digital divide on educational outcomes.

9. Recommendations

ICT education should be included in teacher education curricula at various teachers training institutions with qualitative programmes that will address ICT knowhow.

Provision of necessary infrastructural support: power supply, internet facilities and others. Also, massive training and deployment of skilled manpower to the various teacher education institutions should be encouraged.

Teacher education curriculum should be reformed or re-structured to accommodate ICT education in order to meet new educational challenges.

Adequate funding by relevant bodies: Government, international donors etc: should be provided for the entire educational sector. Particularly teacher training institutions with emphasis on ICT development.

Teacher training institutions should design and deliver in-service and pre-service training programmes for teachers.

10. Conclusion

Just as education is important to the overall development of the society, it is much more important to note here that, qualitative teacher education through the introduction of ICT in teacher education is a sine qua non for the country's educational and national development, because no education system might rise above the quality of teachers. The need to integrate ICT into teacher education is right now inescapable in order to meet the changing global and national educational goals, which are designed for the nation's sustainable development.

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Environmental Variables and Adolescent Behavioural and Emotional Outcomes in Secondary Schools in Ogun State, Nigeria

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Abstract. Influence of Environmental Factors on Adolescent Behavioural and Emotional Outcomes in Ogun State Secondary Schools, Nigeria. This study examined how environmental factors influence adolescents' behavioural and emotional outcomes in secondary schools in Ogun State, Nigeria. A descriptive survey design was adopted. The population is comprised of senior secondary school students in urban, semi-urban, and rural areas of Ogun State. Using stratified random sampling, 150 students aged 13-19 were selected from three schools, one from each location. Data was collected using a researcher-developed instrument, the Environmental Variables and Behavioural Patterns Inventory [EVBPI], a 36-item questionnaire with a 4-point Likert scale. The instrument had a Cronbach's alpha reliability of 0.82. Hypotheses were tested using one-way ANOVA for location effects and two-way ANOVA for interaction effects at 0.05 significance level. Findings showed a significant difference in behavioural and emotional outcomes across urban, semi-urban, and rural locations [$F(2,147) = x.xx$, $p < .05$]. Specifically, students in urban areas reported higher incidence of disruptive behaviour, while those in rural areas scored higher on emotional resilience. No significant interaction effect was found between location and gender. The study concludes that school and neighbourhood environment significantly shape adolescent behaviour and emotion. It recommends that the Ministry of Education and school administrators strengthen counselling services, improve school environments, and implement location-specific intervention programmes. Professional counsellors should design coping strategies tailored to the environmental challenges faced by students in each location.

Keywords: Environmental variables, adolescence, school, emotional, behavioural pattern, output.

1. Introduction

Man has gained tremendous sequence of knowledge through different experience based on self conscious and unconscious interaction with one's environment such as contact with tradition, culture parents, schoolteachers, internet facilities, basic amenities, peer groups, religion, market, industries, banking system and schools. Environment factors in the context of this study stand for any condition outside the individual which could affect adolescents' behaviour. According to Joachim, Millicent and Petronilla, (2013) environment refers to all the factors, other than genetic which influence the individual's physiological, sociological and psychological growth from conception to death. Anderson, (2005) stated that both genetic and environment dynamic factors are also determinants in one's behavioural pattern. Environment characteristics are considered as conditions that affect the behaviour of an individual.

Adolescence is a transition period between childhood and adulthood and covers the ages of 10-19 years (Steinberg, 2013). It is, however, important to know that the period of adolescence varies from culture to culture. The period of adolescence is when young people exhibit different characteristics, for example, they look at themselves as outstanding and special. They mask their insecurity with shyness, heightened sensitivity, and occasional aggressiveness. Adolescents also pursue new identities, engage in peer selection, are curious, seek adventures, easily excited and often confused about their role (Steinberg, 2013). These characteristics can be the result of the impact of different environmental variables. Social environment of the child impacts upon the behavioural development, while the society provides the socio-cultural climate in which the child develops and by implication affects the behavioural patterns of the

individual (Chen, Zhang, and Wang, 2025, Silva, Silva, Mendonça, Florindo, and Farias Júnior, 2025). Osarenren *et al.,* (2013) underscores the immense influence exerted by the environment in the development of the individual. It is asserted that environment is the sum of all the external influence or forces which shape the development and behaviour of a person in life. Koss, Kronaizi, Brown, and Brooks-Gunn (2025) asserts that environmental unpredictability across childhood predicts anxiety, depression, delinquency and impulsivity among adolescents. Findings on developmental contextualization have added to the understanding of community context in its articulation of the ecologies that inform development and how adolescents are influenced by their social contexts. Children in rural areas, for example, are known to skip classes on market days or during farming season to help their parents on their various farms. This gives opportunity for truancy and the attendant maladaptive behaviours. On contrary, urban adolescents often show more disruptive behaviour while rural ones are more resilience (Chen *et al.,* 2025). Nature and environment are essential predictors for human development. Findings on normal child development and on development of maladaptive behavioural patterns revealed that individual, social and community conditions as well as their interactions influence behaviour (National Agency of Science, USA, 2011).

There is credence to contextual effect suggesting that living in areas of concentrated poverty like rural environment, restricts the opportunities to residents and aggravates individual disadvantage, fostering sub-cultural orientations and problems in behaviours especially among children and adolescents (Martinsone, Ģērmane, Neves-McCain, 2026, Murie and Mustard, 2004, Friedrichs, Galster and Musterd, 2003). The same thing occurs in the semi-urban environment, the only difference is that the restriction of opportunities and sub-cultural orientation will not be as grievous as it is in the rural area, but this does not connote that the adolescents in the urban area do not have or display maladaptive behaviour.

The urban environment in this study is well developed, hence, has such basic amenities as electricity, hospitals, schools, social attractions, recreational facilities and internet facilities being a state capital. The adolescents in this environment are better exposed and informed than those from rural or semi-urban environments who either lack or have limited access to those amenities and facilities. Of note, is lack of schools and hospitals and where present, they are deprived of basic facilities. Job opportunities are lacking while farming and menial jobs are common. One would have concluded that the adolescents within the urban environment will have better decision-making skills and be of better behaviour than those within the rural and semi-urban environment but that is not so. For instance, there is no problem of internet fraudulence among adolescents in the rural environment because of lack of internet facilities which exist among the adolescents in the semi-urban and urban environment.

Children or adolescents in each environment have their manner of displaying their behavioural patterns in different ways. The adolescents in the urban environment are well exposed and mostly with better family variables functioning than those in the semi-urban and rural environment. Family functioning has an influence on the development of self-esteem, while self-esteem is a predictive factor in adolescent social context (Osarenren, Ubangha and Oke, 2008). Contextual effects illustrate a child whose parents are unemployed but lives in an affluent neighbourhood who has better prospects than that of a similar child whose parents are unemployed and live in a deprived neighbourhood. The family environment and the school environment have always been linked to psychosocial and behavioural adjustment problems in adolescence. The quality of adolescent parent, peer group, and school-student interactions influence may determine the way adolescents perceive themselves in relation to others, their attitude and their behaviour (Chen *et al.,* 2025, Lila, Berelga, and Musitu, 2006, Werner, 2004).

Moreover, adolescents in the rural area lack many amenities which make it more problematic for them to make analytical or informed decisions, though they receive advice from the village elders that possess little information or they try to move to the urban or semi-urban area to be well informed. The effect of neighbourhood characteristics or environmental variables on the development of adolescents is considered huge, some research has been able to establish links between structural characteristics of school i.e. the environmental variables and behavioural outcomes (Moore, 2026, Astor, Meyer, and Behre, 2004). Schools currently use a wide array of strategies to change social and behavioural outcomes of their students. Schools have broad structural characteristics that vary depending on the environment (such as the socio-economic status of the proportion they serve, the school size, availability of recreational facilities and counselling units etc.). The factors interact and contribute to the experience an individual has at school. There is significant evidence for a connection between socio-economic status and risk behaviour. Living in an affluent neighbourhood or

urban location where basic amenities are available with greater population of educated and professionals is associated with advantages for adolescents' academic achievement, (although more so for adolescent boys than for girls). Living in a neighbourhood with low socio-economic status or semi-urban location confers risks to adolescents in terms of a host of behavioural, social and emotional problems. Living in a poor neighbourhood or rural location also places adolescents at risk for early childbearing and related sexual risk behaviours. Neighbourhood structure could have both direct and indirect effects on adolescent risk behaviour, but it is also likely that there are specific intermediary mechanisms, such as social processes. Thus, one model for linking neighbourhood structure or environmental variables to adolescent outcomes is the institutional resources model or the hypothesis that young people are influenced by the quality, quantity, diversity and affordability of neighbourhood resources.

Gorman-Smith, Tolan and Leventhal (2007) found that living in a disadvantaged neighbourhood may be associated with many poor outcomes for youth, including delinquency, violence, substance use, lower academic achievement, problems with social competence, and mental health problems. Internet access, now widely promoted even for very young children through toy-related game websites designed, has introduced a new source of influence with complex implications (Robert, Foehr and Rideout, 2005). The propensity of adolescents to commit crime becomes higher due to a lot of socio-cultural and psychological changes. Valuable insights into the development and adjustment of problems have been gained through the study of the role of environmental factors in behaviour patterns.

1.1 Statement of the Problem

There is an awareness of the great importance of the environmental factors in the moulding of an adolescent, which end up characterizing the behavioural pattern of the adolescent. There is also great concern about the apparent increase in maladaptive behaviour brought about by adolescents in the various environmental locations which include truancy, high dropout rate, vandalism, internet fraudulent acts, problems with social competence and poor decision making among others. It is likely that neighbourhood or location structure could have both direct and indirect effects on adolescent risk behaviour. It is also likely that there are specific intermediary mechanisms such as social processes. Thus, one mode for linking neighbourhood structure to adolescent outcomes is the institutional resources model, or the hypothesis that young people are influenced by the quality, quantity, diversity and affordability of neighbour resources e.g. schools, health and social services, recreational and social programs as well as employment opportunities. It is on this premise that this study seeks to examine environmental variables as antecedents of Adolescents behavioural and emotional output in secondary schools in Ogun State, Nigeria.

1.2 Purpose of Study

- To find out if there is any significant relationship between adolescents' perception of environment and behavioural challenges.
- To find out the relationship between adolescents' environment, decision making skill and emotional pattern.
- To compare the relationship between adolescents' environment or neighbourhood characteristics and vulnerability to delinquency and crime.
-
- To consider the gender difference in the behavioural pattern of adolescents across the three locations.

1.3 Hypotheses for the Study

Ho_1: There is no significance relationship between types of environments (rural, semi-urban and urban) and adolescent behavioural patterns.
Ho_2: Types of environments will have no significant influence on adolescent decision-making and emotional patterns.
Ho_3: Adolescent environment does not significantly influence vulnerability to crime.
Ho_4: There is no significant gender difference in the behavioural pattern of adolescents across locations.

2. Research Methodology

This study was purposely carried out so as to have an in-depth view of influence of the environmental factors on the behavioural pattern of Adolescents. The research design used for the study was descriptive survey research design. This design requires that the variables of interest had finished interacting among themselves before the research. This research work describes and interprete issues, conditions and practices that exist or views that are going on, it also helps to obtain a systematic analysis of the relationship between the adolescents' behaviour and their different environment. The population of the study comprised all Senior Secondary School Students between age 13-

19 from urban, semi-urban and rural school locations. A total number of one hundred and fifty (150) adolescents from three different secondary schools randomly selected from three different local government areas participated in this study representing the urban, semi-urban and rural areas. Fifty adolescents were randomly selected from each environment. A self designed instrument titled "Influence of Environmental Factors on Adolescents Behavioural Pattern Inventory" (EVBPI). The instrument was divided into two major parts: A and B, part A measured the Biodata of participants which comprised of age, location, local government area and state. Part B of the instrument is made to elicit responses in so as to test and discuss the hypotheses generated. This part contains thirty-six statements against which the participant responded according to the stated four-point scale: SA – Strongly Agreed, A – Agreed, D – Disagreed, SD – Strongly Disagree. All the participants were given sufficient time to respond to the items; the researcher ensured that they understood what was entailed and the instrument was collected back immediately at finishing.

To check for the reliability of the instrument, a trial test was done with thirty respondents similar to the actual research sample. The trial test was meant to reveal deficiencies of the instrument and allowed the researcher to make meaningful modifications to the research instrument. After administering the trial group, separate scores were assigned to every participant, that is, the items on the instrument were split into two halves namely odd and even items. The scores of the halves were computed and correlated using the split-half measure of reliability. The reliability of the scores was estimated using the Spearman-Brown Prophecy formula. The overall reliability of the scale was 0.75. This means that there was a positive correlation between the even and the odd numbered items the questionnaire is adjudged reliable. The reliability of the scale is 0.75, Spearman 0.84.

3. Results

The results are presented in figure and tabular forms.

Table 1: Descriptive Analysis of the Participants Gender Status

Gender	Frequency	Percentage (%)
Male	69	46
Female	81	54
Total	150	100.0

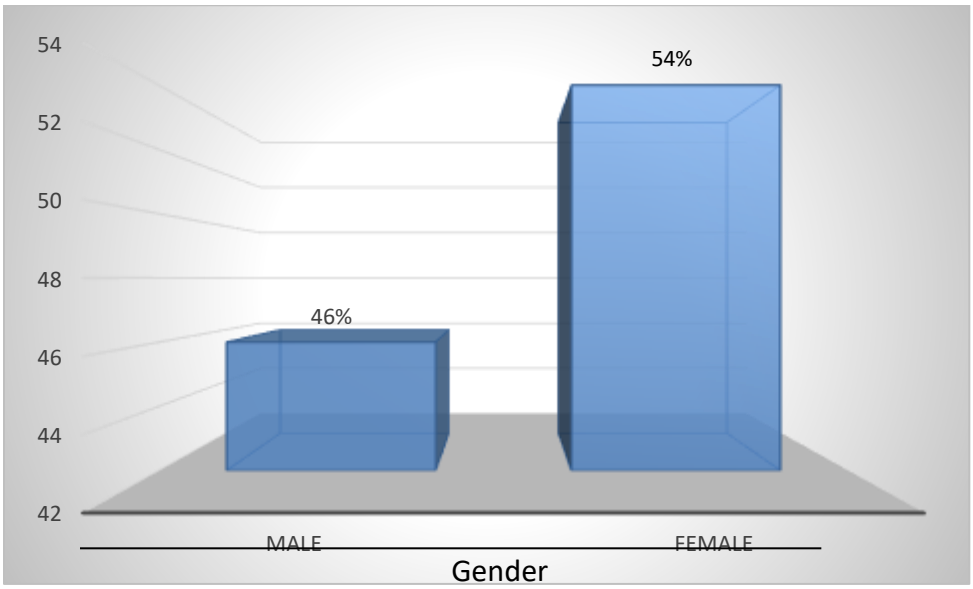

Figure 1: Pictorial View of Participants' Gender Status

Most of the participants were females (54%) of the population while males' participants were only 46% as shown in figure 1.

Table 2: Descriptive Analysis of Participants' Age group

Age group	Frequency	Percentage (%)
13-15 years	53	35
16-17 years	75	50
17 years & above	22	15
Total	150	100.0

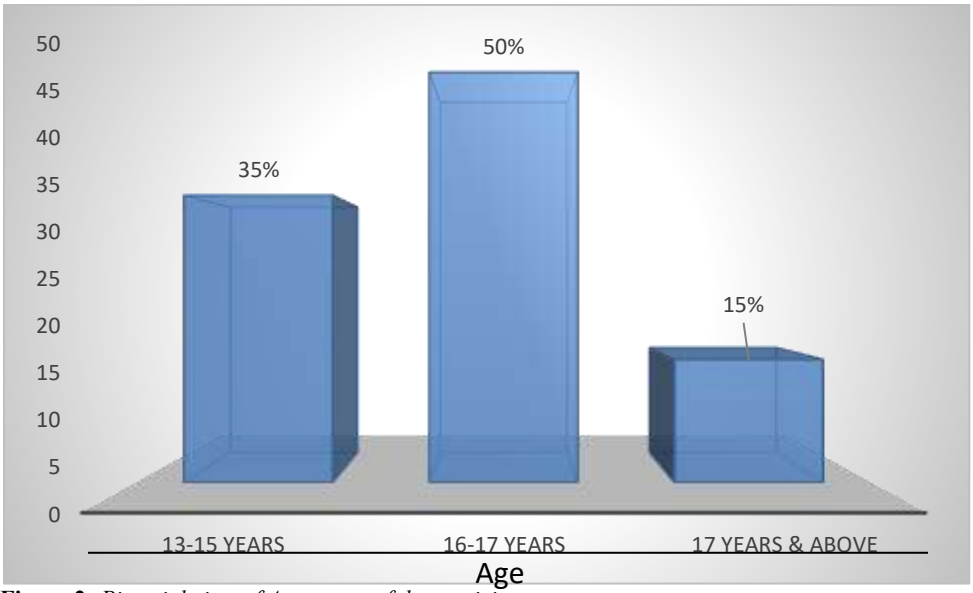

Figure 2: *Pictorial view of Age group of the participants*

Figure 2 shows that 35% of the participants fall into 13-15 years age group; 50% fall into 16-17 age group while 15% were 18 years and above. Thus, most of the participants fall into 16-17 years age group.

Testing of Hypotheses

The results of the hypotheses tested are thus presented.

Ho_1: There is no significant relationship between the environment and behavioural patterns of the adolescent.

Table 3: ANOVA for Adolescent perception of environment with behavioural challenges across locations

Location	N	Mean	SD
Semi-Urban	50	20.94	4.2972
Rural	50	22.68	4.177
Urban	50	22.72	5.852
Total	150	22.11	4.88

	Sum of Squares	df	Mean Square	Fcrit	Sig
Between Groups	103.293	2	51.647	2.21	*.114
Within Groups	3437.780	147	23.386		
Total	3541.073	149			

*Not-sig, p>0.05, df=2&147, F-crit=3.00

Table 3 shows result of F-calculated value of 2.21 as the difference in adolescent perception of environment in relationship with behavioural challenges across locations. This result is not significant as the F-calculated value of 2.21 was less than F-critical value of 3.00 at 0.05 level of significance given 2,147 degrees of freedom. Therefore, the null hypothesis was not rejected. This implies that adolescent perception of environmental relationships with behavioural challenges is the same across rural, semi-urban and urban locations.

Ho_2: Types of Environments will have no significant influence on adolescent decision-making and emotional patterns.

Table 4: Influence of environmental type on adolescent perception in decision making ability and emotional pattern

Locations	N	Mean	Sd
Semi-Urban	50	30.22	5.70
Rural	50	27.280	2.40
Urban	50	29.58	7.54
Total	150	29.027	5.74

	Sum of Square	df	Mean Square	F	Sig.
Between Groups	239.053	2	119.527	3.77	.025
Within Groups	4664.840	147	31.734		
Total	4903.893	149			

Sig $p<0.05$, df=2&147, F-crit=3.00

Table 4 shows result of F-calculated value of 3.77 as the difference in adolescent perception of influence of environment on decision making ability and emotional pattern across locations. This result was significant as the F-calculated value of 3.77 was greater than F-critical value of 3.00 at 0.05 level of significance given 2,147 degrees of freedom. Therefore, the null hypothesis which states that Adolescent environment influences his or her decision-making ability and emotional pattern does not differ across locations was rejected while the alternate hypothesis which states that adolescent environment influences his or her decision-making ability and emotional pattern does differ across locations was accepted. This implies the participants' responses from urban, semi-urban and rural vary. Thus, to determine where the difference lies, a post-hoc analysis was carried out using LCD statistical tool. The result is presented as follows:

Table 5: LCD Post-hoc Analysis

(I) Location	(J) Location	Mean Difference (I-J)	Sig.
Semi-Urban	Rural	2.94*	.010
Urban	Rural	2.30*	.043

The post-hoc analysis of table 5, revealed that students from semi-urban location has better interactive outcomes as regards decision making ability and emotional stability over those from rural location with mean difference-2.94; and $p=0.010<0.05$ while students from urban location has better performance in decision making and emotional stability than the students from rural location with mean difference of 2.30;<0.05. This implies that students from urban and semi-urban locations have better perception of environment influence on decision making ability and emotional patterns than the students from rural locations.

Ho_3. Adolescent environment does not significantly influence vulnerability to crime.

Table 6: One-way Analysis of variance on adolescent environment with vulnerability to crime

Location	N	Mean	Sd
Semi-Urban	50	19.24	4.74
Rural	50	18.48	2.22
Urban	50	18.54	5.39
Total	150	18.75	4.32

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	17.853	2	8.927	0.47	*.623
Within Groups	2768.020	147	18.830		
Total	2785.873	149			

*Not-sig, $p>0.05$, df=2&147, F-crit=3.00

Table 6 shows F-calculated value of 0.47 as the difference in adolescent perception of environmental influence on vulnerability to crime across locations. This result is not significant as the F-calculated value of 0.47 was less than F-critical value of 3.00 at 0.05 level of significance given 2,147 degrees of freedom. Therefore, the null hypothesis three was not rejected. This implies that adolescent perception of environmental influence on vulnerability to crime is the same across rural, semi-urban and urban locations.

Ho_4 There is no significant gender difference in the behavioural pattern of adolescents in urban, semi-urban and rural environments.

Table 7 shows F-calculated value of 0.69 as gender difference in the behavioural pattern of adolescents in urban, semi-urban and rural environments. This result is not significant as the F-calculated value of 0.69 was less than the F-critical value of 3.00 at 0.05 level of significance given 2,144 degrees of freedom.

Table 7: Two-way Analysis of variance on gender difference in the behavioural pattern of adolescents across locations-Descriptive Statistics

Gender	Location	Mean	Std. Deviation	N
Male	Semi-Urban	30.93	6.44	27
	Rural	26.69	2.87	16
	Urban	29.23	6.56	26
	Total	29.30	6.00	69
Female	Semi-Urban	29.39	4.71	23
	Rural	27.56	2.13	34
	Urban	29.96	8.62	24
	Total	28.79	5.52	81
Total	Semi-Urban	30.22	5.70	50
	Rural	27.28	2.39	50
	Urban	29.58	7.54	50
	Total	29.03	5.74	150

Tests of Between Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	283.170[a]	5	56.634	1.765	.124
Intercept	119538.135	1	119538.135	3725.280	.000
Sex	.016	1	.016	.001	.982
Location	237.420	2	118.710	3.699	.027
Sex * Location	44.109	2	22.055	.687	.505
Error	4620.724	144	32.088		
Total	131286.000	150			
Corrected Total	4903.893	149			

Not-sig p>0.05, df=2&144, F-crit=3.00

Therefore, the null hypothesis which states that there is no significant gender difference in the behavioural pattern of adolescents in urban, semi-urban and rural environment was not rejected. This implies that adolescent gender does not influence adolescent behavioural pattern across the locations.

4. Discussion of Findings

This research work examined the influence of environmental factors on Nigerian adolescents' behavioural pattern comparison between urban, semi-urban and rural dwellers in Abeokuta, Ogun State. The findings revealed that adolescents' perception of environmental relationship with behavioural challenges is the same across the three different locations which is in line with Anderson (2005) which stated that both genetic and environment dynamic factors are also determinants in one's behavioural pattern. The findings also reiterated that environmental determinants are considered as conditions that affect the behaviour of individuals, which in accordance with Osarenren *et al.,* (2013), the environment is the sum of all the external influence or forces which shape the development and behaviour of a person in life. Adolescence is the period in which patterns of behaviour which have long-life consequences are formed and become established. Thus, the environment in which the adolescents are brought up constituted a lot with their behavioural pattern. According to Osarenren *et al.,* (2013), Ngale (2009), the family is the foundation of human society; hence, the family is therefore the most natural environment for human development. Parental monitoring and discipline prevent association with deviant peers throughout the adolescence stage. However, Omoegun, (2004) explained that the effects of what happen during prenatal period and the earliest months and years of a child's life can last a lifetime.

Bada and Ayodele (2013) suggested that the quest for independence has led adolescents to take positions and views different from those of the parents and other adults, and to act in conformity with their peers no matter how unconventional this act may be. Due to the pressure from the peer group the behavioural pattern changes as a result of inability to control or through lack of assistance from a significant other.

Ajose, (2007) finds out that adolescent have problems; many of these result from hormonal influences, inexperience, culture and behaviour presented by the society to him in general. They degenerate into health challenges, lack adjustment to societal expectation, misinformation about their physique, inadequate coping skills and strategies.

The findings revealed that adolescent environment influences his or her decision-making ability and emotional pattern across location which is in accordance with Osarenren, 2013 who underscores the immense influence exerted by the environment in the development of the individual. Adolescents' vulnerability to delinquent behaviours is predicated on both the external and personal factors of individual parents and has a direct impact on the wellbeing of their children (Rosenberg and Wileox, 2006). However, many parents believe that they can help mould their children into well-adjusted adults who can control their impulses with regards to vandalism, fraudulent acts, poor decision making and such other antisocial and destructive behaviours (Finkenaner, Engels and Baymeister, 2005).

There is, the need to recognize and detect early behaviour problems and find strategies to intervene and prevent the full blown of behavioural and emotional problems in children and adolescents (Gutman and Eccles, 2007). Furthermore, the findings from the study revealed that environmental influence on vulnerability to crime is the same across the different study locations. Environmental determinant is considered as conditions that affect the behaviour and development of an individual and circumstances that happened within the time range. Neighbourhood environment has been found to directly affect anxiety/depression, mediated by screen time and moderated by family function (Martinsone *et al.,* 2026, Chen *et al.,* 2025). Also, diverse and safe neighbourhoods have been found to increase recreational activity in Brazilian adolescents (Silva *et al.,* 2025).

The findings also revealed that adolescents' gender does not influence adolescent behavioural pattern across the locations which is in accordance with James, (2004), who opined that it is pathetic to note today that the world is fast turning upside down. The researcher also pointed out that what we used to know about virtue, moral and respect is fast fading out among adolescents both male and female in the society. Moreover, Omoegun, (2004) explained that the effects of what happens during prenatal period and the earliest months and years of a child's life can last a lifetime be it male or female.

5. Recommendations

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

There should be an understanding of the school environment characteristics by the school Principal to initiate and put in place adequate adjustment strategies in the school for the students be it the urban, semi-urban or the rural locations.

The school authority can also liaise with the parents to provide in whatever capacity possible certain structural amenities for the school for the well-being of their wards. This will also be dictated by the environmental type.

There is need for preventive guidance and counselling in each school across environmental locations. This prevents the full blown of behavioural and emotional problems.

Peer group with negative influence should be identified for sanctions and corrections for self adjustment and achievement.

6. Conclusion

Links have been made between school characteristics, environmental variables and behavioural outcomes of Adolescent. There is need to work with individuals and families to manage or cope with stresses of living in a disadvantaged neighbourhood, be it urban, semi-urban or rural. Since the condition or environment in which students learn is of great importance and it will greatly influence the type of behavioural pattern that will be put up. Helping and directing someone to understand one-self and circumstances under which one operates is the job of professional guidance counsellor.

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Leveraging Artificial Intelligence Tools for Sustainable Entrepreneurship Skills in Clothing and Textile Education: A Study of Vocational Education Institutions in Lagos State, Nigeria

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Abstract. Leveraging artificial intelligence (AI) tools for sustainable entrepreneurship skills in clothing and textile education was a study of vocational institutions in Lagos state, Nigeria. Conducted among 225 respondents from three (3) tertiary institutions offering clothing and textile as a course. Two research questions and two (2) hypothesis guided the study, it was a descriptive survey design, and the instrument for the data collected was a structure questionnaire containing 29 questions which was further subjected to face validity by three experts. The data was analyzed using, mean, Chi square and Friedman's test. The result revealed that 225(100%) of the respondent answered yes, student are trained in practical skills, 150(66.7%) answered yes, vocational students are equipped with digital skills, 210(93.3%) answered yes, harmful practice to the environment is taught, 210 (93.3%) answered yes, clothing and textiles is a sustainable entrepreneurship education. 205 (91.1%) answered yes, teachers are using creative methods for student, 160 (71.1%) answered yes, one of these methods is using (AI). Majority 175(77.8%) answered yes, AI is used for fashion designing. 160 (71.1%) answered yes AI tools are used to forecast. Majority 130(57.8%) yes AI is used to enhance supply chain. Majority 180(80%) answered yes AI is a tool for sustainable entrepreneurship education skills in clothing and textiles. In conclusion AI tools has insignificantly contributed to sustainable entrepreneurship in clothing and textiles. It is recommended that students need to be properly trained and equipped in handling these tools by teachers to be prepared for the job market.

Keywords: Artificial Intelligence Tools, Clothing and Textiles Education, Entrepreneurship Skills, Leveraging, Sustainable.

1. Introduction

Artificial Intelligence (AI), is defined as the theory and development of computer system capable of doing tasks ordinarily requiring human intelligence such as visual perception, speech recognition, decision making, and translation (Monica, Alok, & Samridhi, 2022). Learning from experience and adapting to new situations, it uses complex algorithms, and mathematical models to process large amounts of data and extract meaningful patterns and insights, which allow them to improve their performance overtime, (Bravo, & Iturralde, 2024). Artificial intelligence (AI) and its field are strong tools for enhancing performance and productivity in textile and fashion, starting from design concepts to forecasting of upcoming trends, faults detection, quality and colour assessment of textiles, concepts and design, production logistics and distribution, retail and fashion forecasting, (Hassan, Mumtaz & Hafsa, 2024, Sathish, Muthuvelamman & Jayachandra, 2024). Clothing and textiles which is the study of garment and fabric explores the history, design, production, and cultural significance of clothing and textiles to include materials-fibers, yarns, fabrics, process of weaving, knitting, sewing, social and historical contents of clothing and textile and bridges the gap between practical craft and academic inquiry (Azonuche, 2024, Melissa, Flavia & Barbara, 2024). It is a vocational or entrepreneurial subject that equip student, with practical skills application to various jobs in the fashion and textile industry, resulting in self-reliance

and entrepreneurship. It focuses on hands-on training and preparing students for careers in tailoring, garment construction and design in these fields. The curriculum often includes elements relevant to current fashion and textile industry, such as digital design and sustainable practices, also incorporates elements of business and marketing, further supporting students who wish to start their own ventures, (Azonuche & Abamba, 2024, Jane, James & Joanna, 2024). Entrepreneurship education can be formal, non-formal or informal and helps increase entrepreneurship intentions and activities, improve business performance, enhance employability, social and economic development (Desousa, Daniel, & Edsom, 2024, Heliona & Jonida, 2023, Jomon & Sreeramana, 2023, Joern, Jantje & Helle, 2023). The emergence of new digital technologies has revolutionized education beyond the advancement of technology. Education no longer relies on traditional methods but technology to change the way of learning. This integration of technology focuses on improving learners' capabilities beyond simply mastering skills. Teachers are exploring more creative and differentiated methods to provide students with richer curriculum and learning experiences. (Jooyound & Sungeun, 2024, Azonuche & Abamba, 2024, Jane, James, & Joanna, 2024). In clothing and textiles, the introduction of technology such as Artificial Intelligence (AI) is making would be entrepreneur to make her business sustainable. Sustainability is the present needs without enlarging the need of future generations by safe guarding the natural environment and social well-being, making sure that, the economic and development does not pose a threat to the well-being and environment, (Paola & Chiara, 2024, Leo, Francklin, Anna & Edumudo, 2023). The fashion industry often falls short of sustainability, with the advancement of technology, there are a wide-range of AI tools to address these issues, among would be practitioners. (Hiqmal, Rebecca, Julia, Saniyat, Georgia & Azadeh, 2025, Jo & Charlene, 2024, Paola & Chiara, 2024). AI offers innovative solutions by improving design process using enabled tools instead of manual to create clothing designs. Tools such as Abode, Mid-journey, DALL. E, to co-create mood boards, sketches and even full outfit designs in real time collaboration in ideation for designers to explore while maintaining creative control, automated generation of ten packs, color ways and 3D prototypes which helps the acceleration of the journey from sketch to sample (Cem 2025, Oleksandra, 2025, Bravo & Iturralde, 2024). AI, tools is used in predictive analytics to forecast consumer demand, this helps to prevent overstocking, thereby reducing waste. Machine learning (ML) is an AI tool used forecasting fashion trends, for historical data identification of patterns to predict future trends for natural language processing (NLP), to analyse data such as articles reviews and social media post. The computer vision of algorithms is used to analyze images and videos and can identify visuals like colours, shapes, and silhouettes. All these are powered by AI tools and platforms such as Trendalytics, Heuritech, Stylumia, WGSN, Geostyle, Designoval, Exploding Topics and Brandwatch (Cem, 2025, Arisekola, 2025, Hiqmat et al, 2025, Leo et al, 2023, Mengyun, Cali, Pinyi, & Menglin 2021). AI, improves fashion retail by processing large volumes of financial and transactional data, generating accurate invoices without the need for manual intervention. Linking online and offline behavior enabling a seamless Omni-channel experience. Tools such as Stampli and Expensify for document processing, automate invoice processing, expense tracking and payment work flow. Data rails and planful AI, for financial reporting, SAP predictive Analytics and tools like Alteryx for identification of fraud, Data Robot and Zest AI for strategic decision-making forecast. Personal finance assistant tools are chat GPT, and Gemini (Anurag, & Kusum, Miguel, 2025, Joan, 2025, Cem, 2025, Oleksandra, 2024). AI, algorithms and data analytics have been integrated in design by collecting and analyzing historical data from various sources including social media platforms, fashion blogs, and e-commerce platforms, to analyze text, image and video data simultaneously such as, fashion shows footage, Tik-Tok content, customer reviews, shapes of garment or material, displaying customer sentiments and emerging designs using dash-board (Cem, 2025, Sathish, Muthivelammai & Jayachanchan, 2024, De Souse et al, 2024). AI, has been used in error-prone tasks in garment manufacturing through robotics to improve work load safety and also to enhance supply chain management, by tracking materials and inventory, analyze logistics, data, improve collaboration and monitor compliance with sustainability standards. (Muhammad, Mehmet, & Hassnian 2025, Cem, 2025, Bravo & Iturralde, 2024). There is also virtual influencers generated by AI, for fashion marketing and digital storytelling with brands creating custom avatars to represent niche customer personas as using 3D modeling, using platforms like Tik-tok, Instagram and snap-chat, Avatars can be tailored to align with campaign themes and customer expectations (Hiqmat, 2025, Cem, 2025 2025, Bharati, 2023). Emotion AI, in fashion also known as effective computing, recognize customer emotion via, web-cam or App to detect micro expressions or voice tone with consent to interpret emotional state, such as excitement, confusion or frustration. Based on these, AI recommends fashion pieces like bold colours when happy, cozy styles when anxious, using a trained psychological style mapping.

Chat-bot can be used to input and analyze conversations to infer-mood and style preferences which has been used by researchers to develop virtual reality (VR) fashion show to analyze participant's facial expressions and physiological responses during (VR) virtual reality catwalk to provide their emotional reactions. This depended customer connection and refine marketing strategies (Cem, 2025, Omid, 2025, Hassan, et al 2024, Leo et al, 2023, Monica, et al, 2022).

AI tools that monitor social media include feed Hive for content and conditional posting, Buffer Tailors posts to each channel, Predis.Ai, generates carrousels, Publer generates post, text and images. Content studio helps entrepreneurs stay on top of content topics and Hoot suite for varieties of AI post prompt while story chief creates content and multiple channels and flick for a social media AI copilot (Mighel, 2025, Arisekola, 2025, Omid, 2025). There is AI driven smart clothing that monitors the health and the environment for patients which detects pollutants and update patients about exposure to pollutants giving them real time insights to personal air quality. AI tools in smart clothing include Zyler and Vue.Ai, Zalando's generative Ai, Ai-powered fitness trackers and smart watches, helps to adjust insulation or ventilation in response to temperature changes, monitor signs by providing valuable health insights, used in sports and rehabilitation, control fabric colour based on environment. Ai-driven tools like Khroma, New Arc.ai, and Zmo.ai and Ai-powered outfit, Planners such as Glance Ai, style DNA. The new Black and smart closet provide outfit suggestion and personalized style insight (Anurag et al, 2025, Amara, 2024, Oleksandra, 2024). Ai system is now being used to create experiences that cater for individual preference fostering customer engagement and loyalty using smart mirrors and fitting-rooms which offers suggestions on alternative sizes, colors, styling tips based on customer interactions, craft personalized e-mail, customers' unique styles, past preferences or purchases. The virtual try on technology using Augmented Reality (AR) allows customer to digitally try-on clothes, make-up and other products to inform decisions, reducing return, increase sales and enhance brand loyalty. (Cem, 2025, Sathish, et al, 2024, Oleksandra, 2024). AI is used to power circular fashion platforms and second-hand fashion platforms for the detection of signs of wear, pilling, stains, and stretched seams from up loaded images to reduce manual quality checks and ensure consistency, classification by brands, category, size, style and trend. This helps to adjust prices to optimize resale speed and margin, also enhance photo quality by correcting colors to boost engagement (Hiqmat et al 2025, Cem, 2025, Jane, James & Joana, 2022). Ai tools for second hand platforms include, style chat-box, GPT-5 and a computer model that recognize brands styles and aesthetics across web's vintage resale sites. Second hand clothing is being reshaped and marketed with tools like prime Ai, Photo-shoot, prime Ai, size and fit finder as well as Zyler virtual try-on. They enable seamless personalized and eco-friendly shopping experiences for clothing and textile student would entrepreneurs in circular fashion. (Miguel, 2025, Omid, 2025, Joan, 2025, Svetlana, 2020). Ai, when used to advertise ensures the advertisement gets the most relevant audience, increasing changes in conversion. These tools include Cray O for short form videos, brand well for generating SEO (search engine optimization) blog posts, originality Ai for AI content detection, Brand 24 for media monitoring, influencity for influencer marketing, Notion AI for productivity, Gum loop for best AI automations and many more (Omid 2025, Okorie, 2025, Victoria 2025, Jo & Charlene, 2024, Paola et al, 2024, Monica et al, 2022). Clothing and textile education landscape is evolving with the integration of artificial intelligence which has emerged as a transformative force, reshaping the traditional paradigms of product development and has given rise to a new era where data driven insights, predictive analytics and innovative applications of AI are revolutionizing the way garment are conceived, designed and brought to market helping to reshape the creative and logistics aspects of an industry that thrives on innovation and trends (Oleksandra, 2024, Bharati, 2023, Woojin, et al, 2023). Ai has significantly contribute to sustainable entrepreneurship in the clothing and textile education, by optimizing processes, reducing waste, returns and enabling more sustainable practices throughout the value chain (Muhammad et al, 2025, Cem, 2025, Paola et al, 2024, Leo et al, 2023).

1.1 Statement of the Problem.

The increasing adoption of Artificial Intelligence (AI) in the clothing and textiles industry has created new opportunities for innovation, sustainability, and entrepreneurship. However, many vocational education institutions in Lagos State, Nigeria, have not fully integrated AI tools into Clothing and Textiles Education, limiting students' ability to develop relevant entrepreneurial skills for the modern fashion industry. Despite the potential of AI to enhance creativity, productivity, and sustainable business practices, there is limited research on its use in developing sustainable entrepreneurship skills among clothing and textiles students. Therefore, this study seeks to examine how AI tools can be leveraged to

promote sustainable entrepreneurship skills among students in vocational education institutions in Lagos State, Nigeria.

1.2 Objective of the Study

The main objective of the study was Leveraging Artificial Intelligence (AI) tools for entrepreneurship skills in clothing and textile education: A study of vocational education institution in Lagos state, Nigeria. Therefore, the following objective were formulated to:

- Examine clothing and textile skills as entrepreneurship education in vocational institutions.
- Examine Artificial Intelligence (AI) tools for sustainable entrepreneurship skills in clothing and textile education in vocational institution.

1.3 Research Questions

- What are the clothing and textile skills as entrepreneurship education in vocational institutions?
- What are the Artificial Intelligence (AI) tools for sustainable entrepreneurship skills in clothing and textile education in vocational institutions?

1.4 Research Hypothesis

Hypothesis 1: There is no significant entrepreneurship education skill for clothing and textiles in vocational institutions in Lagos state, Nigeria

Hypothesis 2: There is no Artificial Intelligence (AI) tool for sustainable entrepreneurship skills in clothing and textiles education in vocational institutions in Lagos state, Nigeria

2. Research Methodology

Design of the Study: Descriptive survey research design was adopted to enable the respondents go through the questionnaire to give their personal opinions about the problem being investigated.

Area of the Study: The area of the study was Lagos state, Lagos state University of Education, Otto/Ijanikin, Lagos University, Akoka, Yaba College of Technology, Yaba, and Federal College of Education (Technical) Akoka.

Population of the Study: The population of the study constituted 225 respondents. 70 from Lagos State University of Education, 50 from Lagos University, Akoka, Yaba College of Technology, 80, Federal College of Education (Technical) Akoka, 25.

Instrument for Data Collection: A structured questionnaire was used for data collection titled: Leveraging Artificial intelligence tools for sustainable entrepreneurship skills in clothing and textile education. The first part contained demographic information of respondents while the second part with two sections containing 11 question items for respondents based on specific objectives. Table one had 11 questions on entrepreneurship skills in clothing and textiles as a vocational education, table II had 18 questions on artificial intelligence tools for sustainable entrepreneurship skills in clothing and textile as a vocational education.

Validity and Reliability of the instrument: The instrument was given face validity by three (3) clothing and textile lecturers. Their constructive corrections were effected and test retest was used to determine the reliability and consistency of the instrument. This shows that the instrument was valid and reliable.

Method of Data Collection: The questionnaire was administered to 225 respondents with the help of Google form through their class platforms.

3. Method of Data Analysis

Data were analyzed with mean and chi-square from the Friedman's test. The results are presented below.

Hypothesis 1: There is no significant entrepreneurship education skill for clothing and textiles in vocational institutions in Lagos state, Nigeria

Table 1: Entrepreneurship Education Skills for Clothing and Textiles in Vocational Institutions

S/N	Statement (n=225)	Yes (%)	No (%)	Mean Rank	χ^2 (p-value)
1	Clothing and textiles is a vocational education	225(100)	0(0)	6.61	83.264*
2	Clothing and textile students are trained in practical skills	225(100)	0(0)	6.61	(<0.001)
3	Trained how to construct garment	210(93.3)	15(6.7)	6.24	
4	Pattern drafting skills is one of the skills you are equipped with	205(91.1)	20(8.9)	6.12	
5	As a vocational student you are equipped with digital skills	150(66.7)	75(33.3)	4.78	
6	Technology has been adopted as a skill in clothing and textile	195(86.7)	30(13.3)	5.88	
7	You are taught how to run a successful fashion business	185(82.2)	40(17.8)	5.63	
8	Harmful practice to the environment is one of the skills taught in clothing and textile	210(93.3)	15(6.7)	6.24	
9	Clothing and textile skills were formerly done manually	170(75.6)	55(24.4)	5.27	
10	Clothing and textile is a sustainable entrepreneurship education	210(93.3)	15(6.7)	6.24	
11	Clothing and textiles students can be self-employed	215(95.6)	10(4.4)	6.37	

* Significant at 5% level

The chi-square value ($\chi^2 = 83.264$, $p<0.001$) from the Friedman's test infers that there are significant entrepreneurship education skills for clothing and textiles in vocational institutions in Lagos state, Nigeria ($p<0.05$) which are garment construction skills, digital skills, how to run a successful fashion business, and harmful practice to the environment.

Hypothesis 2: There is no Artificial Intelligence (AI) tool for sustainable entrepreneurship skills in clothing and textiles education in vocational institutions in Lagos state, Nigeria

Table 2: Artificial Intelligence (AI) tools for sustainable entrepreneurship skills in clothing and textiles education

S/N	Statement (n=225)	Yes (%)	No (%)	Mean Rank	χ^2 (p-value)
1	Teachers of clothing and textiles are using creative methods for students	205(91.1)	20(8.9)	11.10	275.920* (<0.001)
2	One of these methods is using artificial intelligence (AI)	160(71.1)	65(28.9)	10.70	
3	There is AI tool for measurements taking	75(33.3)	150(66.7)	7.70	
4	AI tool is used for fashion designing	175(77.8)	50(22.2)	11.30	
5	Are you aware that there are virtual try-ons technology for clothing and textile	135(60)	90(40)	9.70	
6	AI tools are used to forecast customers' demands	160(71.1)	65(28.9)	10.70	
7	Use AI tools for second hand platforms to identify trends in class	180(80)	45(20)	11.50	
8	Use AI tools as virtual influencers for fashion marketing	165(73.3)	60(26.7)	10.90	
9	AI tools are used to analyze data for clothing and textile class	65(28.9)	160(71.1)	6.90	
10	Content management in clothing and textiles classes are done using AI tools	45(20)	180(80)	6.10	
11	Aware there are AI- driven tools for smart clothing as a clothing and textiles student.	135(60)	90(40)	9.70	
12	Aware also, there are AI tools for advertising clothing and textile	75(33.3)	150(66.7)	7.70	
13	Use AI tools for design garments using customers emotions during classes	110(48.9)	115(51.1)	8.70	
14	Use AI for fashion shows in school	50(22.2)	175(77.8)	6.30	
15	There is AI tool to enhance supply chain	130(57.8)	95(42.2)	9.70	
16	Using AI tool will make clothing and textiles as a vocational education more efficient	175(77.8)	50(22.2)	11.70	
17	The fashion industry in which clothing and textiles belong has been blamed for unsustainability practices	120(53.3)	105(46.7)	9.10	
18	AI is a tool for sustainable entrepreneurship education skills in clothing and textiles	180(80)	45(20)	11.50	

* Significant at 5% level

The chi-square value ($\chi^2 = 275.920$, $p<0.001$) from the Friedman's test deduces that there are significant Artificial Intelligence (AI) tools for sustainable entrepreneurship skills in clothing and textiles education in vocational institutions in Lagos state, Nigeria ($p<0.05$). These tools include: virtual try-ons technology for clothing and textile, forecasting customers' demands tool, second hand platforms to identify trends tool, virtual influencers for fashion marketing tool, smart clothing tool, and supply chain tool.

4. Discussion of Findings

Table I was on entrepreneurship education skills for clothing and textiles in vocational institutions in Lagos state. The table reveal that all respondents, 225 (100%) answered yes, clothing and textile is a vocational education. This is in line with, (Azonuche, 2024, Melissa, et al, 2024). 225 (100%), answered yes, clothing and textile students are trained in practical skills, as opined by (Azonuche, et al, 2024, Jane et al, 2024). 210 (93.3%) answered yes, they are trained on how to construct garments, 15 (6.7%) answered no. As supported by (Azonuche, et al, 2024, Jane et al. 2024). 205 (91.1%) answered yes, they are equipped with pattern drafting skills, 20 (8.9%) answered no, as supported by Azonuche, 2024, Melissa et al, 2024). 150 (66.7%) answered yes, as vocational students they are equipped with digital skills, 75 (33.3%) answered no. This is in line with (Hassan et al, 2024, Sathish et al, 2024). 195 (86.7) answered yes, technology has been adopted as a skill in clothing and textile, 30 (13.3) answered no. As observed by, (Cem, 2025, Oleksandra, 2026, Jooyound, et al 2024). 185 (82.2) answered yes they are taught how to run a successful fashion business, 40 (17.8) answered no. As opined by (De Sousa et al, 2024, Heliona, et al, 2023, Jomon, et al, 2023, Joern et al, 2023). 210 (93.3) answered yes, harmful practices to the environment is one of the skills taught in clothing and textiles, 15 (6.7) answered no. As noted by, (Azonuche, et al, 2024, Jane et al, 2024, Paola, et al, 2024 Leo, et al, 2023). 170 (75.6) answered yes, clothing and textile skills were formerly done manually, 55 (24.4) answered no, this is in line with, (Jooyound, et al 2024) 210 (93.3) answered yes, clothing and textile is a sustainable entrepreneurship education, 15 (6.7) answered no. As Supported by, (De Sousa et al, 2024, Heliona, et al 2023, Jomon, et al, 2023, Joern et al. 2023). 215 (95.6) answered yes, clothing and textiles students can be self-employed, 10 (4.4) answered yes, as observed by (Azonuche, 2024, Melissa, et al, 2024, Jane, et al, 2024).

Table II was on artificial Intelligence (AI) tools for sustainable entrepreneurship skills in clothing and textile education in vocational school. The table reveal that out of 225 respondents; 205 (91.1) answered yes, teachers of clothing and textiles are using creative methods for students 20 (8.9) answered no. As supported by (Jooyound, et al 2024, Azonuche, et al, 2024, Jane, et al, 2024). 160 (71.1) answered yes, one of those methods is using artificial intelligence tools. 65 (28.9) answered no. As opined by (Paolo, et al, 2024, Bravo, et al, 2024, Leo et al, 2023), 75 (33.3) answered, yes there is AI tool for measurements taking, 150 (66.7) answered no. Contrary to (Miguel, 2025, Omid, 2025, Joan, 2025, Svetlana, 2020). 175 (77.8) answered yes, Al tool is used for fashion designing, 50 (22.2) answered no. As noted by (Cem, 2025, Oleksandra, 2024, Bravo, et al 2024). 135 (60) answered yes, they are aware there are Virtual – try-ons technology for clothing and textiles, 90 (40) answered no. As noted by (Cem, 2025, Sathish, et al, 2024, Oleksandra, 2024). 160 (71.7) answered yes, AI tools are used to forecast customers demand, 65 (28.9) answered no. This is in line with (Anurag, et al, 2025, Miguel, 2025, Joan, 2025, Cem, 2025, Oleksandra, 2024), 180 (80) answered yes, they have used AI tools for second hand platforms to identify trends, 45 (20) answered no. As observed by (Hiqmat et al, 2025, Cem, 2025 Miguel, 2025, Omid, 2025). 165 (73.3) answered yes, they use AI tools as virtual influencers for fashion marketing, 60 (26.7) answered no. This is in line with (Higmat, 2025, Cem, 2025, Bharati, 2023). 65 (28.9) answered yes, AI tools are used to analyze data for clothing and textile class 160 (71.1) answered no, contrary to (Cem, 2025, Arisekola, 2025, Higmat et al, 2025, Leo et al, 2025). 45 (20) answered yes, content management in clothing and textiles classes are done using AI tools, 180 (80) answered no. This is contrary to (Cem, 2025, Sathish, et al, 2024 De Sousa, et al 2024). 135 (60) answered yes they are aware, there are AI-driven tools for smart clothing as a clothing and textile student, 90 (40) answered no. As observed by (Anurag, et al, 2025, Amara, 2024, Oleksandra, 2024). 75 (33.3) answered yes, they are aware, there are AI tools for advertising clothing and textiles. 150 (66.7) answered no. Contrary to (Omid, 2025, Okorie, 2025, Paola, et al, 2024, Monica et al, 2022), 110 (48.9) answered yes, they use AI tools for designing garments using Customers emotions during classes. 115(51.1) answered no. Contrary to (Gen, 2025, Omid, 2025, Hassan et al, 2024, Leo et al, 2023, Monica et al, 2020), 50(22.2) answered yes, AI is used for fashion shows in their school. 175(77.8) answered no. Contrary to (Cem, 2025, Sathish, 2024, De Sousa et al, 2024). 130 (57.8) answered yes, there is AI tool to enhance supply chain, 95 (42.2) answered no. As supported by (Muhammad et al, 2025, Cem, 2025, Bravo and Iturradle, 2024). 175 (77.8) answered yes using AI tool will make clothing and textiles as a

vocational education more efficient, 50 (22.2) answered no. As opined by (Oleksandra2024, Bharati, 2023, Woojin et al, 2023). 120 (53.3) answered yes, the fashion industry in which clothing and textiles belong has been blamed for unsustainability practices, 105(46.7) answered no. In line with (Hiqmat et al, 2025, Jo and Charlene, 2024, Paola, et al 2024). 180 (80) answered yes, AI is a tool for sustainable entrepreneurship education skills in clothing and textiles, 45 (20) answered no, as supported by (Muhammad et al, 2025, Cem, 2025, Bravo and Iturradle, 2024, Leo et al, 2023).

5. Conclusion

Student of clothing and textiles are trained in various entrepreneurial skills. The introduction of technology like (AI) Artificial intelligence has made the training seamless, making clothing and textile efficient and sustainable as a vocational course.

6. Recommendations

From the findings students should be:

- Properly trained in the use of the tools before venturing into the world of work
- Trained personnel's to be employed by the institutions to equip students in AI tools to be able to leverage Artificial Intelligence tools for sustainable entrepreneurship skills in clothing and textile.

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Nexus between the Place of Technology in Science Teaching and Theoretical Foundations of Science Teaching in Nigerian Secondary School: Past, Present, and Future

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Abstract. This paper discusses the Nexus Between the Place of Technology in Science Teaching and the theoretical foundations of Science Teaching in Nigerian secondary schools, from traditional methods to contemporary digital technologies. It also examines persistent challenges, including inadequate infrastructure and teacher capacity gaps, and explores emerging trends such as mobile learning, virtual laboratories, and artificial intelligence applications. The paper suggests that strategic investment in infrastructure, comprehensive teacher professional development, and context-appropriate technology solutions is critical for transforming science education in Nigerian secondary schools.

Keywords: Technology, Theoretical Foundations of Science Education, Nigerian Secondary Schools, Digital Learning, Pedagogical Innovation

1. Introduction

Science education serves as the cornerstone for technological advancement and societal development. In Nigeria, where the government has consistently emphasized the importance of scientific and technological literacy to drive economic growth, the quality of science teaching in secondary schools remains crucial. The integration of technology into science education has emerged globally as a transformative approach to enhancing learning outcomes, making abstract concepts tangible, and preparing students for an increasingly digital world (NPE, 2013).

Nigerian secondary schools are tasked with developing students' scientific literacy, critical thinking skills, and practical competencies in science subjects such as Biology, Chemistry, Physics, and Basic Science. However, traditional pedagogy, characterized by teacher-centered instruction, rote memorization, and limited practical demonstrations, has proven inadequate for meeting the demands of 21st-century education.

Despite global recognition of technology's potential to revolutionize science teaching, Nigerian secondary schools face significant challenges in effectively integrating technological tools. Many schools lack basic laboratory equipment, let alone modern digital technologies. Where technologies exist, inadequate teacher training, poor maintenance culture, irregular power supply, and limited internet connectivity often render them underutilized or non-functional. This dearth in technological input resulted in students graduating with theoretical knowledge but limited practical skills, placing them at a disadvantage in higher education and the job market. This paper focuses on: examining the historical evolution of technology in science teaching in Nigerian secondary schools; assessing the current state of technology integration; identifying challenges and barriers; exploring the emerging trends and innovations in science teaching; and showcasing evidence-based suggestions for sustainable technology integration.

1.1 Technological Innovation in Science Teaching

Technology encompasses the use of tools, processes, and systems designed to enhance the teaching and learning of school subjects. In science teaching, this includes hardware (computers, projectors, laboratory equipment, tablets) and software (simulations, virtual laboratories, educational applications) that facilitate teaching and learning of scientific concepts. The Technological Pedagogical Content Knowledge (TPACK) framework provides a useful lens for understanding effective technology integration. This framework emphasizes that successful integration requires the intersection of technological knowledge, pedagogical knowledge, and content knowledge. Teachers must understand not only the technology itself but also how to apply it pedagogically to teach specific scientific content effectively.

Technology has systematically facilitated scientific literacy, inquiry skills, and conceptual understanding through evidence-based methods. It bridges scientific knowledge with educational practices through various result-oriented methods, strategies, and philosophies shaped by theories that explain how learning occurs and why certain instructional approaches are effective. In contemporary education, science teaching is no longer limited to content delivery but involves nurturing critical thinking, problem-solving, creativity, and responsible citizenship. Technology, therefore, plays a dual role of developing scientific competencies and preparing learners for participation in a scientifically dynamic world.

Modern societies depend on inputs of science and technology for growth, development, and sustainability. As a result, it is logical for science teaching and learning to respond to global challenges emanating from climate change, health crises, and economic uncertainties. These demands are teaching approaches that are theoretically grounded, learner-centered, and adaptable to diverse learning contexts.

1.2 Theoretical Foundations and Science Teaching

Theoretical foundations provide the intellectual base upon which science curricula, instructional strategies, and assessment practices are developed. It provides the explanatory and predictive frameworks that guide how science should be taught and learned. These principles explain why educators choose specific methods, strategies, and classroom approaches. They answer fundamental questions such as: how do students learn science? Why do certain teaching approaches succeed while others fail? and other thought-provoking frameworks to aid the teaching and learning of science subjects. These theories move science education from intuitive or traditional practices to evidence-informed strategies that go beyond the transmission of facts, incorporating systematic guidance for designing, implementing, and evaluating instruction. Understanding these foundations provides educators with ideas to help them make informed decisions that enhance student engagement, deepen conceptual understanding, and foster critical thinking and problem-solving skills essential for scientific and societal progress.

Theories help clarify student misconceptions, promote conceptual change, and support differentiated instruction. In an era of rapid scientific advancement and global challenges like climate change, theoretically informed science teaching equips learners to think critically and adaptively. These theories also enable educators to systematically design lessons, implement activities, and evaluate outcomes. Several important purposes in science teaching are supported by theories. These include guiding curriculum development by determining what knowledge is important and how it should be organized1; informing instructional strategies by explaining how learners process information and construct meaning3; and shaping assessment practices by defining what counts as learning and how it should be measured4. Without theoretical foundations, science teaching becomes fragmented, mechanical, and inconsistent, whereas with theoretical backing, teaching becomes coherent, purposeful, and scientifically informed.

1.3 Major Theoretical Frameworks in Science Teaching

1.3.1 Behaviourism

Behaviourism views learning as a change in observable behaviour shaped by environmental interactions, through associations, reinforcement, and consequences. Key figures include Pavlov, Watson, and B.F. Skinner, who submitted that teaching should reinforce correct responses and extinguish incorrect ones. Though limited in explaining internal cognitive processes, behaviorism encourages instructional design, classroom management, and performance assessments through its emphasis on practice, feedback, and conditioning.

In science teaching, behaviourism is reflected in drill-and-practice exercises, structured laboratory procedures, repetition, and reward systems. Though limited in explaining internal cognitive processes, behaviourism continues to inform instructional design,

classroom management, and performance assessments through its emphasis on practice, feedback, and reinforcement.

1.3.2 Cognitivism

Cognitivism shifted focus from observable behavior to internal mental processes, showcasing how learners receive, store, and organize information. Learning is seen as an internal process where instruction is designed to influence cognitive structure. Cognitivism encourages the use of concept maps, advance organizers, structured explanations, and scaffolding to stimulate learning. It helps teachers to design lessons that move beyond memorization to higher-order thinking. Bloom's Taxonomy, which includes domains such as analysis and evaluation, is widely used to frame science learning objectives as it provides a cognitive framework for designing objectives across levels such as knowledge, comprehension, application, analysis, synthesis, and evaluation.

1.3.3 Constructivism

Constructivism views learning as an active process where learners construct knowledge based on experience and prior understanding. It is central to modern science teaching and learning with several key perspectives, such as:

a) Cognitive Constructivism
Jean Piaget proposed that learners construct knowledge through interaction with their environment, via assimilation and accommodation. He emphasized that understanding science requires cognitive restructuring aligned with developmental stages. In practice, this means designing science activities that match students' cognitive readiness, providing concrete experiences before abstract reasoning, and encouraging active exploration and manipulation of materials. Piaget's stage theory underscores the importance of hands-on, discovery-based learning in science, particularly in early and middle childhood[9].

b) Social Constructivism
Lev Vygotsky, a proponent of the Zone of Proximal Development (ZPD), emphasized the social nature of learning such that there exists a space occupied by what a learner can do independently and what he or she can do with guidance. In this school of thought, collaboration, dialogue, and cultural tools are seen as central to meaningful science learning. This context translates to peer-led discussions, group investigations, and teacher modeling of scientific reasoning and practices. Social constructivism highlights the role of culture and community in shaping scientific literacy and identity[10].

c) Discovery Learning
Jerome Bruner propounded that learners construct their new experiences through guided exploration, advocating for learner-centered and inquiry-driven approaches. Discovery learning in science involves presenting students with problems or phenomena to investigate, providing resources and guidance to learners by allowing them to formulate hypotheses, test ideas, and draw conclusions based on their new experiences. This approach fosters intrinsic motivation, critical thinking, and a deeper conceptual understanding of scientific principles[11].

1.3.4 Social Cognitive Theory

Albert Bandura's theory integrates cognitive processes with social contexts, emphasizing self-efficacy, modeling, and reciprocal interactions among learners, their behavior, and the environment[3]. Observational learning and imitation are key mechanisms in this scenario, thereby making this framework highly relevant to collaborative and peer-learning settings in science. Social Cognitive Theory supports collaborative and peer-learning settings. Teachers can model scientific practices such as precise measurement, systematic observation, and logical reasoning, while also fostering a classroom climate that encourages risk-taking and persistence. Strategies here include using think-aloud protocols, peer tutoring, and showcasing diverse role models in science. Examples are contributions of scientists from various backgrounds in enhancing students' self-efficacy in science, which are crucial. In cases where there are underrepresented groups of learners, learning can be achieved through mastery experiences, vicarious learning, verbal persuasion, and positive emotional states[3]. This theory is especially relevant in inquiry-based and project-based learning environments where social interaction and self-regulation are key.

1.3.5 Inquiry and Situated Learning

Cognitive Theory of Inquiry Teaching (Collins & Stevens) prioritizes metacognitive skills, questioning, hypothesis testing, and reflection[12]. Situated Learning stresses that knowledge is contextual and embedded in activity and social interaction, advocating for authentic science practices and communities of practice. In science teaching and learning, this advocates for authentic science practices and learning environments that mirror real-world scientific work. Examples include conducting fieldwork, participating

in citizen science projects, engaging with science professionals, and using technology simulations that replicate laboratory or environmental settings. Situated learning helps bridge the gap between school science and everyday life, making learning more relevant and meaningful[13].

1.3.6 Constructionism (Seymour Papert)

Papert extended constructivism into constructionism, where learners build tangible artifacts to deepen understanding. Papert argued that learning is most effective when learners are actively creating something shareable and reflective of their thinking. This approach is especially relevant in science labs, engineering projects, and technology-enhanced learning. Examples include building models (e.g., DNA models, solar systems), designing experiments, coding simulations, and creating digital portfolios. Constructionism emphasizes the role of tools and technologies as cognitive partners that extend thinking and facilitate expression. In contemporary STEM education, constructionist principles underpin maker movements, robotics clubs, and computational thinking initiatives.

1.4 Emerging Theoretical Perspectives in Science Teaching

1.4.1 Connectivism

Proposed by George Siemens and Stephen Downes, connectivism is a learning theory for the digital age. It posits that learning resides in the connections formed between individuals, information sources, and digital networks. In science teaching and learning, connectivism highlights the importance of navigating, evaluating, and synthesizing information from diverse online resources, databases, and collaborative platforms. It supports the development of digital literacy skills, such as critical evaluation of scientific information online, participation in global scientific communities, and the use of data visualization and analysis tools. Connectivism encourages a shift from knowledge acquisition to knowledge networking, thereby preparing students for a world where scientific knowledge is rapidly evolving and widely accessible.

1.4.2 Complexity Theory and Systems Thinking

Complexity theory emerged from chaos theory and systems science, views learning and knowledge as emergent phenomena which emanated from interactions within dynamic, adaptive systems. In science teaching, this perspective encourages holistic and interdisciplinary approaches, such as teaching ecology, climate science, or human body systems as interconnected networks. It promotes systems thinking skills: recognizing patterns, understanding interdependencies, and anticipating unintended consequences. Pedagogical strategies in this view include using simulations of complex systems, case studies of real-world problems (e.g., pandemic response, ecosystem management), and project-based learning that requires integrating multiple scientific disciplines.

1.4.3 Integration of Theories to Science Teaching and Learning and Relevance

Effective science teaching integrates multiple theoretical insights, recognizing that no single theory can address all aspects of learning. An eclectic, principled approach allows educators to draw on the strengths of various frameworks to meet diverse instructional goals and student needs.

Behaviorism provides structure for practice, reinforcement, and skill acquisition, useful in teaching foundational procedures (e.g., lab safety, measurement techniques) and managing classroom routines.

Cognitivism helps organize information, sequence instruction, and develop higher-order thinking skills through tools like concept mapping, metacognitive prompts, and scaffolded problem-solving.

Constructivism and Inquiry promote active, student-centered learning through hypothesis testing, experimentation, and reflection 2,8. They encourage curiosity, conceptual change, and the development of scientific reasoning.

Social Cognitive Theory supports collaborative and motivational contexts, emphasizing modeling, self-efficacy, and social interaction in learning communities.

Constructionism enriches hands-on, project-based learning by emphasizing the creation and sharing of tangible artifacts.

Situated Learning and Connectivism connect classroom science to real-world contexts and digital networks[13], enhancing relevance and preparing students for lifelong learning

Several learning theories underpin technology use in science education. Constructivism suggests that technology facilitates learning by allowing students to actively explore and construct understanding through simulations and virtual experiments. Cognitive Load Theory indicates that well-designed educational

technologies can reduce cognitive load by presenting information in multiple modalities, making complex scientific concepts more manageable. Social Constructivism emphasizes how collaborative technologies enable students to engage in scientific discourse and collectively problem-solve.

1.5 Philosophical Bases Underpinnings of Science Teaching

1.5.1 Positivism

Views knowledge as objective, empirical, and verifiable. Early science curricula were heavily influenced by positivism, emphasizing laboratory work, controlled experiments, and factual accuracy. Teaching was largely teacher-centered, with learners expected to observe, memorize, and reproduce scientific facts. Although modern science teaching has moved beyond strict positivism, its influence remains visible in standardized testing, laboratory accuracy, and emphasis on empirical evidence.

While positivism contributed to the emphasis on empirical evidence and scientific rigor, its limitations include the neglect of subjective experience, the social construction of knowledge, and the role of prior beliefs in learning. Despite these criticisms, elements of positivism persist in standardized testing, competency-based assessments, and curricula that prioritize content mastery over process.

1.5.2 Pragmatism

Rooted in John Dewey's philosophy, pragmatism stresses learning by doing and the integration of theory with real-world problems [6,7]. It supports inquiry-based and experiential activities essential to science teaching. This approach values the process of learning as much as the product, encouraging curiosity, collaboration, and critical reflection. Pragmatism emphasizes the adaptive nature of knowledge, recognizing that scientific understanding evolves through continuous investigation and social negotiation. These philosophies set the stage for modern learning theories, which emphasize shifting from passive reception to active construction of knowledge.

1.5.3 Humanism

Humanism emphasizes the holistic development of the learner, including emotional, social, and moral dimensions. Learning is viewed as a personal process driven by motivation, self-concept, and personal meaning. In science education, humanism supports learner autonomy, self-directed learning, and supportive classroom environments. It encourages teachers to consider students' interests, values, and experiences as part of science learning.

1.6 The Past: Historical Evolution Colonial Era to Independence (Pre-1960 To 1960)

During the colonial period, science education in Nigeria was rudimentary and limited to elite mission schools and government colleges. Technology in science teaching was minimal, consisting primarily of basic laboratory glassware and simple demonstrations. Science laboratories, where they existed, were modelled after British schools but often lacked adequate supplies. Practical science was a privilege of a few urban schools, while rural schools relied almost entirely on theoretical instruction.

1.7 Post-Independence Development Phase (1960-1980)

Following independence, Nigeria made concerted efforts to expand and improve education. The first National Development Plan (1962-1968) emphasized science education as critical for national development. The government established science schools and invested in laboratory infrastructure for selected secondary schools. During this period, audio-visual aids such as filmstrips, overhead projectors, and educational radio programs were introduced in some urban schools. However, technology adoption remained concentrated in urban areas and federal government colleges.

1.8 Economic Crisis Era (1980-1999)

The economic downturn of the 1980s, triggered by falling oil prices, severely affected educational funding. Laboratory equipment became scarce, maintenance of existing facilities declined, and importation of new technologies virtually ceased in many public schools. Despite challenges, the 1981 National Policy on Education emphasized science, technology, and mathematics education, though the policy lacked adequate implementation mechanisms and funding.

1.9 Early Digital Age (2000-2015)

The new millennium brought renewed optimism. The National Policy on Information Technology (2001) recognized ICT as a strategic tool for education delivery. Computer education was introduced into the secondary school curriculum, and some schools began establishing computer laboratories. The School-Net

Nigeria program aimed to connect schools to the internet, though implementation was inconsistent. Private schools, particularly in urban centers, began investing in multimedia projectors and interactive whiteboards, creating growing disparities with public schools.

1.10 The Current State

The current landscape reveals significant disparities. A 2024 survey found that only 38 percent of public secondary schools have functional science laboratories with basic equipment, while this figure rises to 82 percent for private schools in urban areas. Computer-to-student ratios remain extremely poor, averaging 1:87 in public schools compared to 1:12 in well-resourced private institutions. Internet connectivity is available in approximately 29 percent of secondary schools nationwide, with significant urban-rural divides. Many schools struggle with unreliable electricity supply, making sustained technology use impractical.

1.11 Types of Technologies Currently in Use

Basic Laboratory Equipment remains the primary technological tool in most schools, though many items are outdated or non-functional. Multimedia Projectors and Interactive Displays have been adopted by progressive schools for displaying diagrams, videos, and simulations. Computer-Assisted Learning through software like PhET simulations provides virtual laboratory experiences where available. Mobile Learning leverages Nigeria's 85 percent mobile phone penetration, with apps providing supplementary learning resources. Learning Management Systems saw accelerated adoption during COVID-19, though adoption remains limited in public schools.

2 Government Policies and Initiatives

Recent initiatives include the National Digital Economy Policy and Strategy (2020-2030), which emphasizes digital literacy and ICT infrastructure development. The STEM Education Policy (2023) prioritizes science, technology, engineering, and mathematics education with provisions for enhanced technology integration and teacher training. Several states have implemented technology-focused programs, such as Lagos State's EKO Digital Initiative.

3 Teacher Competence

Teacher technological competence remains a significant concern. A 2025 study found that only 41 percent of science teachers rated themselves as proficient in using educational technology, while 23 percent reported minimal or no exposure during pre-service training. Professional development opportunities exist, but are inadequate in scale and quality.

4 Challenges and Barriers

4.1 Infrastructure Deficits

Nigeria's electricity challenges represent perhaps the most fundamental barrier. Frequent power outages make consistent technology use difficult, and many schools lack backup generators. Internet access remains limited and unreliable, with bandwidth often insufficient for multimedia content. Many school buildings lack basic infrastructure necessary for technology integration, such as insufficient electrical outlets, inadequate security for expensive equipment, and unsuitable classroom layouts.

4.2 Funding

Educational funding has consistently fallen below UNESCO-recommended levels, averaging approximately 6-8 percent of national budgets in recent years. This severely restricts technology procurement, maintenance, and upgrade capabilities. The high cost of imported technology, exacerbated by currency depreciation, places modern educational technologies beyond most public schools' reach. Corruption and budget implementation inefficiencies mean allocated funds often fail to translate into actual technology resources.

4.3 Teacher-Related Challenges

Many science teachers lack adequate training in educational technology integration. Pre-service teacher education programs have been slow to incorporate technology pedagogy. Some teachers resist adopting new technologies due to comfort with traditional methods or fear of appearing incompetent. Heavy teaching loads and large class sizes leave teachers with limited time to master and integrate new technologies.

4.4 Socio-Cultural Factors

Nigeria's education system remains heavily examination-focused, with teaching oriented toward preparing students for standardized tests. This culture sometimes discourages exploratory, technology-enabled inquiry learning. Cultural factors continue to influence gender participation in science and

technology. Vast disparities exist between urban and rural schools in technology access, teacher quality, and infrastructural development.

5 The Future: Emerging Trends

5.2 Artificial Intelligence and Machine Learning

Artificial intelligence offers transformative possibilities for personalized science learning. AI-powered tutoring systems can adapt to individual student learning pace and style, providing customized feedback. In Nigeria, emerging start-ups are developing AI-powered educational platforms tailored to local curricula, showing promise for improving learning outcomes at scale.

5.2 Virtual and Augmented Reality

Virtual reality can transport students into microscopic cellular environments, geological formations, or astronomical phenomena. Augmented reality applications can overlay digital information onto physical objects, enhancing traditional experiments. While currently expensive, mobile-based AR applications accessible via smartphones present more immediate opportunities for Nigerian schools.

5.3 Cloud-Based Virtual Laboratories

Cloud-based virtual laboratories provide solutions to Nigeria's laboratory equipment challenges. Students can conduct simulated experiments, manipulate variables, and observe outcomes without requiring expensive physical equipment. Cloud-based solutions also facilitate collaboration among students from different schools.

5.4 Mobile Learning and Offline Solutions

Given Nigeria's high mobile penetration and ongoing connectivity issues, mobile-first educational solutions offer a practical way forward. Progressive Web Apps that work offline after initial download enable students to access learning content without constant internet access. SMS-based learning platforms have proven to be effective for delivering quick lessons and quizzes.

5.5 Open Educational Resources

The Open Educational Resources movement presents significant opportunities. OER provides free, openly licensed educational materials, including textbooks, videos, simulations, and lesson plans. Expanding OER use could dramatically reduce the cost of quality science education materials while allowing contextualization for local relevance.

6 Strategies for Sustainable Integration

6.1 Phased Implementation Approach

Sustainable technology integration requires realistic, phased implementation. A suggested framework includes:

Phase 1. (Foundation) establishing basic infrastructure, reliable electricity, internet connectivity, and basic ICT facilities;
Phase 2. (Capacity Building) implementing comprehensive teacher professional development;
Phase 3. (Integration and Scaling) gradually introducing advanced technologies as competence develops; and
Phase 4. (Innovation and Sustainability), encouraging contextualized innovation and establishing maintenance systems.

6.2 Public-Private Partnerships

Given government resource constraints, public-private partnerships offer viable pathways for technology integration. Technology companies can provide equipment, software licenses, and technical support. Successful models from Kenya and South Africa demonstrate how telecommunications companies can partner with education sectors to provide scalable digital learning solutions.

6.3 Teacher Professional Development

Effective teacher professional development must be continuous, practice-based, and embedded in teachers' daily work. This should include pre-service education reform, induction programs with mentorship, continuous professional development through online learning communities, and school-based support from technology coordinators.

6.4 Context-Appropriate Technology Selection

Technology choices must align with Nigerian realities. Key principles include selecting technologies that match available infrastructure and teacher capacity, prioritizing cost-effective solutions with low total cost of ownership, choosing flexible technologies adaptable to local contexts, and ensuring maintenance and technical support structures exist before deployment.

7 Conclusion

The place of technology in science teaching in Nigerian secondary schools has evolved significantly from the rudimentary equipment of the colonial era to the current digital age, with its immense possibilities and persistent challenges. While progress has been made, particularly in urban private schools, the overall landscape reveals concerning disparities and unrealized potential.

The past demonstrates that good intentions and progressive policies alone are inadequate without adequate resources, effective implementation mechanisms, and sustained commitment. The present reveals a system at a crossroads, where foundational challenges coexist with emerging opportunities. The future depends on coordinated action from multiple stakeholders. Technology is not a panacea for all educational challenges, nor will technology alone transform science education. However, appropriately selected, properly implemented, and effectively utilized technology can significantly enhance science teaching and learning in Nigerian secondary schools. The goal is improved learning outcomes, enhanced scientific literacy, and better preparation of students for an increasingly technological world.

Nigeria's aspirations for scientific and technological advancement depend significantly on the quality of science education provided today. Technology must play a central role, but a role defined by Nigerian realities, guided by sound pedagogy, and sustained by adequate resources and commitment. With strategic vision, enough investment, collaborative effort, and persistent commitment, Nigerian secondary schools can realize the transformative potential of technology in science education. The time for action is now. The theoretical foundations of science teaching offer multiple perspectives on how students learn and how teachers can facilitate that process. From behaviorism to constructivism and social cognitive theory, these frameworks provide conceptual clarity, methodological rigor, and pedagogical coherence. To address evolving global and local challenges, science education must continue to refine and expand its theoretical approaches. Ultimately, effective science teaching is theoretically informed, adaptable, and transformative. It empowers learners not only to understand science but also to apply it thoughtfully, critique it responsibly, and contribute to its ongoing evolution. By grounding practice in robust theory, educators can inspire the next generation of scientists, innovators, and informed citizens, capable of navigating and shaping a complex, scientifically driven world.

8 Recommendations

For Government and Policymakers

Allocate at least 2 percent of education budgets specifically for educational technology with strict accountability mechanisms. Develop a comprehensive national EdTech strategy with clear milestones and success metrics. Prioritize basic infrastructure, electricity, and internet connectivity as prerequisites for sustainable technology integration. Establish technology centers of excellence in each state to demonstrate effective integration and serve as training hubs.

For School Administrators

Conduct systematic technology needs assessments before implementing new technologies. Develop context-specific technology integration plans aligned with school improvement goals. Establish maintenance and support systems with designated personnel and budgets. Foster environments that encourage experimentation and celebrate technology integration victories.

For Teachers

Actively seek professional development opportunities in educational technology and commit to ongoing skill development. Begin with simple, manageable technology applications and gradually expand. Remember that technology is a tool to enhance teaching, not replace good pedagogy. Engage with professional learning communities to share experiences and learn from colleagues.

For Teacher Education Institutions

Integrate educational technology throughout all courses, modelling effective technology use in instruction. Ensure pre-service teachers experience technology-rich learning environments and practice integrating technology during teaching practicum. Invest in faculty development so teacher educators are competent and current in educational technology.

For Development Partners and the Private Sector

Prioritize investments in foundational infrastructure before advanced technologies. Develop or adapt technologies specifically for Nigerian contexts rather than importing solutions designed for different environments. Include maintenance, training, and long-term support in technology interventions. Build

local capacity for technology development, maintenance, and support.

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Examination Malpractice: The Bane of the 21st Century Nigerian Higher Institutions

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Abstract. Examination malpractice has been a serious threat to the survival of the Nigerian higher education. It poses a serious challenge to the 21st century Nigerian higher institutions. Examination Malpractices has been entrenched in our educational system that many higher institutions in Nigeria are ready to spend any amount of money to stamp it out. It however, appears to have defied any solution. This has resulted in many graduates of Nigerian higher institutions rated very low in terms of job performance and academic prowess, since many of them are regarded as product of large-scale examination malpractice with cheap certificates. The problem has placed the country in a precarious situation which is regrettable and needs immediate attention. The paper therefore examined examination malpractice as the bane of 21st century Nigeria higher institutions. The paper discussed the forms of examination malpractice, Causes and Effects of examination malpractice and ways of eliminating it in Nigerian higher institutions. The paper concluded that though examinations in Nigerian higher institutions have been denigrated, there will be no alternative to examinations in Nigerian higher institutions since it is the only route to certification of a student's character and learning. The following recommendations were made. There should be enough invigilators/ lecturers during examinations to avoid the current situation where some students start examination in their own hall much earlier than the other halls for the same course due to lack of enough invigilators. And examination must start on schedule in all the halls to avoid students running away with answer scripts to another hall or into the bush. There is need for the government to properly equip all Nigerian higher institutions to avoid congestion in examination halls as well as avoid situations where students share desks and question paper because they do not have enough. Adequate security should be provided for all examination material and invigilators to avoid leakage either before or during examinations among others.

Keywords: Examination Malpractice, Forms, Causes, Effects, Ways of eliminating Examination Malpractice

1. Introduction

Education is a systematic process of imparting knowledge through improvement of skills and expertise. It is regarded as a tool for training the citizenry in order to live a better and rewarding life for themselves and for the entire society. Education can also be seen as a life goal achievement for the betterment of the citizenry in order to achieve success in the environment and the society at large (Ossai, 2021). However, to start and progress in any educational institution, assessment must take place and that process of assessment is known as examination. According to Collins in Ossai (2021) examination is a formal test that one can take to show his knowledge or ability in a particular subject or to obtain qualification in a subject or course of study of the person or persons concerned. Education, which is seen as the bedrock of development and one of the foundational factors determining sustainable economic development has been faced with myriads of challenges that includes examination malpractice.

Examination malpractice is a disturbing phenomenon, which has and is still threatening the academic integrity of Nigerian educational system. Examination malpractice makes the aim of education almost unachievable. This poses serious challenges to Nigerian education system, since examination is a test used to ascertain the performance of the learners. The National policy on Education (2014) stated that education is an instrument "Par Excellence for affecting National development. It has witnessed active participation by non-governmental agencies,

communities and individuals as well as government intervention. By this, education in Nigeria is regarded by everyone as a viable entity in transforming the society. But examination malpractice poses a threat to the survival of Nigerian higher education, it is fast becoming an obstacle to the smooth administration of Nigerian higher institution. Examination malpractice has also subjected Nigerian students' academic performance to ridicule that their certificates are often suspicious wherever they are presented.

Examination malpractice in Nigeria could be traced to as far back as 1914 when the first examination malpractice occurred during the senior Cambridge local examination where question papers were leaked before the scheduled date of the examination (Anzene, 2014). This trend however, has gradually increased over the years since the much orchestrated "Expo 70" of the early 1970's without attracting much attention. It was only in the mid 1980^{s} that many Nigerian higher institutions identified it as a cog in the wheel of their development. But while some ignored it, some gave it a fight though mildly. However, it is now becoming increasingly unbearable among Nigeria higher institutions because it threatens the very foundation of education system. The problem posed by examination malpractice in the Nigerian higher institutions is quite enormous and effort by some higher institutions to control it have not yielded the desired result. Although the difficulty in controlling examination malpractices is enormous but there is still hope that it will be controlled through certain measures. This paper therefore will examine the cocept of examination malpractice in Nigerian higher institutions, forms, causes and effect of examination malpractice and ways of eliminating it.

2. Concept of Examination Malpractice

Many Nigerians did not experience any difficulty to define examination malpractice due to the fact that both examination and malpractice are household words. For proper understanding of examination malpractice in this context, the word examination and malpractice could be looked at separately. Examination according to Oxford Advance Dictionary is spoken or practical test at Schools or College especially one that is needed to get a qualification. while Wikipedia defined examination as a test-takers knowledge or skill, physical fitness or classification in many other topics. Examination is seen as an assessment of ability, achievement or persons performances in a subject. According to Anzene (2014), examination is a formal test of one's knowledge or ability in a particular subject especially by means of answering questions or practical exercises. It is through examination that students are evaluated or tested to find out the quality of knowledge they have acquired within a specific period. Examination malpractice is any act of omission or commission which compromises the validity and integrity of any examination (Ministry of Education, 2011).

Fassasi (2016) opined that examination is the tool used to facilitate decision making on performance, educational advancement, and job opportunities for the individual. It is the most common tool around which the whole system of education revolves. Thus, there is hardly any education system which does not have one form of assessment or another as an indicator of the said system. Examination is the instrument used to determine who is permitted to go to the next level of education. In fact, it is the result of examination and teachers' judgment which form the grading system in which all the students are classified annually or more frequently (Akaranga and Ogong 2013). Examination is also seen as an important process of assessing the students' progress, to motivate learners, help to know their strength and weaknesses and provide opportunities for the teachers to try new ways of improving their teaching methods. Examination can be internal or external, oral, written and online. Internal examinations are those set by the teachers in form of class tests and end of term examination. While external examinations are conducted by recognized examining bodies that were not involved in organizing instruction or preparing students for the examinations. According to Anzene (2014), continuous assessment scores, terminal, semester and annual or promotion examination are examples of internal examination while common entrance examination for admission into secondary schools, school certificate examinations which are conducted by West Africa Examination Council (WAEC), National Examination Council (NECO), Unified Tertiary Matriculation Examination (UTME) conducted by Joint Admission and Matriculation Board (JAMB) are examples of external examinations.

Malpractice refers to counter practice that is against ethics of examination. It is an act of disrespect to all rules and regulations guiding the good conduct of any examination or any evaluation process. The English dictionary defined malpractice as improper or unethical conduct by a professional or official persons. Malpractice is also viewed as any deliberate act of wrong doings contrary to the rule of examination designed to give a candidate an unfair advantage or able to frequently place a candidate at a disadvantage (Malami, 2013).

Fassasi (2016) described examination malpractice as a misconduct or improper practice before, during or after any examination by examinees or others with a view to obtaining good result by fraudulent means. Examination malpractice therefore is a form of academic corruption which entails the act of deviation by examiner or examinee from formal rules that regulate their behavior in the examination. Bruno and Obidigbo (2017), defined examination malpractice as anything done by the examination candidate that is likely to render the assessment useless. It is anything made by the stakeholders such as examination's administrators, teachers, parents or students that is likely to render the assessment useless or ineffective. Similarly, Wilayat (2009), defined examination malpractice as a deliberate wrong doing contrary to official examination rules designed to place a candidate at an unfair advantage. Furthermore Wilayat (2009) opined that examination has two main distinct concepts, firstly, to achieve the purpose for which it was designed and secondly, to be a reliable consistent means of measurement. But when irregularity or examination malpractice occurs, then the validity and resulting outcome is questionable. Atakpa (2025) described examination malpractice as any practice that negatively affects the conduct and purpose of any examination; whoever that is involved in subverting the process of any examination is involved in examination malpractice.

Okorie (2015) posited that examination malpractice is an act of wrong doing carried out by a candidate or group of candidates or any other person with the intention to cheat or gain unfair advantage in an examination. It is a deliberate wrong doing contrary to official examination rule designed to place a candidate in an unfair advantage. UNESCO (2021) described examination irregularities and malpractice as any unauthorized or unfair actions that compromise the integrity, validity or fairness of an examination process. Examination malpractice is a deliberate act of indiscipline adopted by students or their accomplices to secure success and advantage before, during or after administration of test and examinations (Ogbonnaya, 2012). It has become a recurrent issue in the Nigerian educational institutions. Examination malpractice has been posing serious challenge to the integrity and assessment process in Nigeria educational institutions from primary to tertiary level but prevalent in the secondary and tertiary levels. According to Ajudeonu (2015) examination malpractice is an illegal act committed by a student single handedly or in collaboration with others like fellow students, parents, teachers/lecturers, supervisors, invigilators, principals and anybody or group of people before, during or after examinations in order to obtain favour to his advantage.

3. Forms of Examination Malpractice in Higher Institutions in Nigeria

Examination malpractice is one of the evils which is fast becoming a threat to the survival and relevance of Nigerian higher institutions. It is developing very fast and in different forms, this is because Nigeria today has placed so much emphasis on success goals without commensurate emphasis on institutional means of achieving these goals. As such higher institutions in the country has trained into a commercial venture and no longer a place for selfless service but rather a place to make quick money and obtain quick certificate. Examination malpractice in Nigerian higher institutions in recent times is one of the results of gansterism. It comes in various forms and involves all kinds of people especially the students. Worthington and Farrar in Okwuenu and Eneogwe (2017) viewed plagiarism as a form of examination malpractice which students are often involved in, such as:

- Stealing of the examination paper ahead of time;
- Copying from someone else's paper;
- Sending or receiving signals during a test;
- Using unauthorized notes or "cheat sheets" during a test;
- Taking an examination for other students or letting someone else take an examination for you;
- Turning a paper that is being bought from a commercial research firm (also known as term paper mill).

They further stated that plagiarism means passing out another person's work as one's own or using peoples' ideas without acknowledging the source. All these forms of malpractice identified by Worthington and Farrar are common in Nigerian higher institutions. Such as giraffing, lateral connection, life wire and contract, sorting, mercenary, microchips, wholesale, conversation or talking, heat and run and tattoos. All these appear to be the commonest ones in the compasses, but there are still some common ones which may have been ignored despite of their magnitude.

Examination malpractice in various campuses is much more than those listed above in magnitude. There are uncontrollable forms of cheating in examinations in Nigerian higher institutions today. Onyechere (2014) referred to examination malpractice as a monster with thirty-three faces. Onyechere also listed other types of examination malpractice like bringing foreign

materials into examination hall, collusion between candidates, collusion between candidates and officials, impersonation, assault and intimidation, mass cheating, leakage, teacher student affairs, assessment malpractice, examination funds malpractice, comfort fund malpractice, spying, passing papers in the hall, whispering answers, submission of multiple scripts, coded or sign language malpractice, snatching of question papers or answer sheets, passports photograph malpractice, marking malpractice, mass promotion, in-tech malpractice, sale of live question papers or answer sheets, expo, multiple entry for the same examination, sale of handouts by lecturers among others. From these various forms of examination malpractice, it is evident that examination malpractice is no longer the business of just one person.

However, other forms of malpractice according to (Ajudeonu 2015: and Okorie 2015) include bringing unauthorized materials into examination hall such as notes, mobile phones, smart devices, page of books, photocopies of prepared answers, candidates tattoo on their bodies with notes on palms and thighs, students carrying materials in wigs or hairs. In addition to these are grafting, passing papers to all, spying, whispering answers, coded or sign language malpractice, submission of multiple scripts, use of magic slippers, customized t-shirt, sorting and so on. Thus, Alozie and Nnorum (2018) noted that sorting is the most recurring thorn in the flesh of Nigerian education system as lecturers lure students into paying specific sums in order to pass examination or get better results. Examination malpractice in Nigerian higher institutions today is perpetuated by a team of examination malpractioners. Onyechere (2014) therefore accuses some parents, school administration, teachers, invigilators, boyfriends and girlfriends, the students, communities as well as the higher institutions of being responsible for the monster called examination malpractice in the country. However, the dimensions of examination malpractice and the caliber of people involved especially in higher institutions portrays that there is a danger ahead.

4. Causes of Examination Malpractice in Higher Institutions

Today in Nigeria certification have become an evidence of educational attainment, it does not mean that acquisition of certificates is bad but their usage as sole indicator or evidence of academic attainment has led to its acquisition by hook or crook. This is true because much emphasis has been placed on certificates than in knowledge and skills. The causes of examination malpractice are multifaceted and influenced by many factors:

Academic pressure to succeed: Pressure to succeed is one of the factors that lead students to indulge in examination malpractice since they want to succeed at all cost irrespective of the after effect of their actions and consequences. Therefore, students may feel immense pressure to achieve high grade and maintain a competitive edge over their peers thereby making them to resort to malpractice. In addition, students cheat to avoid failure due to high expectation from lecturers, parents and the communities.

Phobia for failure: The fear of failure often times make some students to cheat during examinations in order to obtain good grades and avoid negative consequences. Phobia for failure can be seen as curiosity to achieve better result than poor result. As such students do everything within their power to attain better scores and grades.

Indiscipline: Some students lack integrity. This means that they are unable to appreciate the distinction between being honest or dishonest in relation to academics. Thus, students who lack a strong sense of discipline and integrity often resort to examination malpractice to gain an unfair advantage over selfishness.

Poor attitude of students towards their studies: Some students in Nigerian higher institutions waste their time engaging in social activities in campuses or what is called ‘flexing’, at the detriment of their studies. As such they are poorly prepared for examinations and often resort to examination malpractice to make-up for their inadequacies.

Peer group influence: Some students who belong to cult group on campus do not normally attend lectures, group mentality and pressure to conform to the group condition and rule on the campus often lead this cult group members to resort to cheating in examinations.

Institutional weakness and inadequate supervision: Most institutions of higher learning in Nigeria lack enough space for their students during examinations, this may lead to packing students in overcrowded halls during examination. This scenario coupled with inadequate supervision invariably enable students to resort to malpractice like graffing and copying from each other.

Bribery and corruption: Which may be inform of monetary or sexual inducement to obtain answers or better grades during examination.

Lack of surveillance system (CCTV) in most higher institutions in Nigeria.

Favoritism and bias: Most students are given preferential treatment during assessment or invigilation by their teachers/lecturers.

However, all these points mentioned are not encouraging, something has to be done to remedy the situation.

5. Effects of Campus Examination Malpractice

Examination malpractice is an evil that has engulfed campuses of Nigeria higher institutions with regrettable consequences. Its impact ranges from cancellation of examination results to national dishonour. Examination malpractice is a crime as such anybody involved in it is a criminal. Noel in Okwenu and Eneogwe (2017) noted that there is a great difference in the academic achievement of those involved in examination malpractice and those who rely on hard work. Those involved in examination malpractice may record a higher score at the initial stage but this academic achievement is never sustained due to their obvious self-concept which does not enhance success and persistence in school work. Examination malpractice demeans the individual involved. His/her integrity and self-worth are quickly eroded as he/she is treated like a thief in the midst of his fellow students and among teachers.

Examination malpractice especially in the Nigerian higher institutions is a cog on the wheel of both personal development of the people involved and that of the nation. Achigbe in Okwenu and Eneogwe (2017) posited that examination malpractice threatens national development and the validity and authenticity of certificates, increase attrition rate, encourage wastage, create social misfit among the students. It is an evil wind that blows no one any good. It generally makes students to lose confidence in themselves and makes them to feel that academic success can only be gotten through examination malpractice. It also makes the generality of the wider society to lose confidence in Nigerian graduates as they perceive all of them to be products of one form of examination malpractice or the other. As a result of this, one can graduate with any grade from any Nigerian higher institution without being sure of securing job either in public or private sector.

Anybody caught cheating in an examination feels inferior before his course mates and those around him as well as his peers forever. This also affects his performance and ability to cope with life in future. Even when there is high competitive pressure anybody caught in examination could be suspended or expelled and this will have a noticeable effect on the persons scholastic and personal records in future. However, no grade is worth cheating for, since the sense of guilt by short changing fellow students will continue to hunt the person for life. However, the student examination malpractice brings shame to himself, and his entire family including his friends and church members. His ego will be affected for life as he is nicknamed “expo” “dub-dab” among others.

Examination malpractice often destroys standard and the spirit of hard work among the students. In most cases the weak students spend their time planning to cheat in an examination while others are working hard to meet up with their academic works. Sometimes the weak students succeed in completing the examination with good grades but they cannot defend it anywhere within or outside the campus and even in the performance of a very easy task. According to Onyacho (2024) examination malpractice encourages laziness among students, lower standard of education by default, affects employment and productivity, has deadly multiplier effects on the practice of medicine; does serious harm to the national image, has very serious implications on the culprits, can lead to dismissal of student and can make teacher/lecturer lose his job. Involvement in examination malpractice can be very disgraceful and even when the student successfully completes his programme through cheating, he often feels very jittery to present his certificate to any serious-minded person, including employers because he knows that the certificate is gotten through fraudulent means and he cannot defend it.

Examination originally is meant to test candidates’ comprehension and ability thereby leading to the award of certificate, but with examination malpractice invading the education system the certificate will lack credibility. When the country educational system is characterized by examination malpractice other countries will not respect such country’s education system. A country that is ranked highly in examination malpractice loses international credibility (Anzene, 2014). With examination malpractice poorly prepared and half-baked graduates will continue to emerge in the society. These graduates will end up cheating the students instead of teaching them thereby reducing the quality of education in Nigeria. According to Okoli and Oranusi (2019), when students continue to indulge in examination malpractice, they will end up graduating with little or no skills imparted in them. As

a result, are commonly half baked and not suitable for employment.

6. Possible Ways of Eliminating Examination Malpractice in Nigerian Higher Institutions

The alarming rate at which examination malpractice takes place, especially in higher institutions, its spread and caliber of those involved in it have made many Nigerians to believe that it has become part of the Nigerian education system. It is however, believed that examination malpractice can be eliminated totally if there is change of attitude from the students, the parents, guardians and the Nigeria society at large.

The unnecessary emphasis on certificates instead of acquisition of useful skills and knowledge have made examination malpractice a common phenomenon in Nigerian higher institutions. Since it is being perpetuated by the students it is students who can stop it. The very first thing the students will do to curb examination malpractice is to shun it in whichever dimension it may come. To shun examination malpractice means to work hard and rely on one's effort which will be adequately rewarded. When the students are sure of themselves, they can set the standard for others to emulate. Their hard work, determination to succeed without being involved in examination malpractice and their exemplary attitude towards examinations will be enough to motivate the lazy and criminally minded one's around them to shun examination malpractice in its entirety. Whoever shun examination malpractice will ensure that those who plan it do not succeed as they will always take a prompt action against them. The very committed students should form a vanguard against examination malpractioners, to ensure that all those things that facilitate examination malpractice are not encouraged in the campus and examination malpractioners should be treated as outcasts in the campus.

Parents of Nigerian higher education students should wake up to their responsibilities as responsible parents. They should stop sponsoring examination malpractice by enticing or intimidating teachers/lecturers to award pass grades to their children when it is obvious that such children have failed the course. They should stop bribing admission officers to admit their unqualified children for certain programmes. Such students when admitted insist on doing anything within their power including the use of violence to pass examinations. Studies have shown that it is parents who make money available to their children for 'sorting' and sorting can only stop if they withdraw their sponsorship. It is necessary that parents should encourage hard work among their children; as hard work is the only way to success and also provide them with the basic necessities they might need to succeed.

The higher institutions should discourage examination malpractice by employing only the best brains and honest ones and not mediocres and corrupt individuals to teach and handle examinations. A situation where all kinds of people are recruited through godfatherism to teach and handle examinations, is not advisable as they will see it as an opportunity to make money through indiscriminate distribution of scores and sale of grades. Selling of continuous assessment scores is very common in Nigerian higher institutions; such a practice should be discouraged. Thus, teachers/lecturers and the higher institutions authorities should purge themselves of examination malpractice by laying greater emphasis on personal integrity, prompt and decisive actions against examination malpractioners and establishment of environment that discourages cheating.

The entire Nigerian society cannot be completely exonerated from examination malpractice since the unnecessary emphasis on acquisition of certificates instead of knowledge and skills encourage examination malpractice. The notion among the populace that every child is a material for higher education often make some people who are not candidates of higher education force themselves into higher institutions in the country. Levine and Associates (2017) remarked that this is often the basis for the demographic problems of some higher institutions. The crowded nature of some campuses is a source of examination misconduct. The society therefore has to understand the importance of higher education and assist the higher institutions in realizing their noble objectives instead of separating examination malpractice.

7. Conclusion

Examination malpractice is an irregularity premeditated and perpetuated by the students or their agents for the purpose of having undue advantage in the examination, it is a social ill that can destroy a society. Examination malpractice has serious economic, political and social consequences. It makes the goal of examination which is to access the candidates and assert their performance for placement and decision making almost impossible.

Though examinations in Nigerian higher institutions have been denigrated there may not be any other alternative to examinations in higher institutions. It is

still the only route to certification of a student's character and learning. However, both the students, parents and the authorities of Nigerian higher institutions still have an important role to play in restoring the dignity of higher institutions and make them relevant to national development through the worthiness of their certificates and product.

8. Recommendations

There should be enough lecturers/invigilators during examinations to avoid the current situation where some students start the examination in their own hall much earlier than those in other halls for the same course due to lack of enough invigilators. Examination must start on schedule in all the halls to avoid students running away with answer scripts to another hall or into the bush.

There is need for government to properly equip all Nigerian higher institutions to avoid congestion in examination hall as well as avoid situations where students share desks and question papers because they do not have enough.
Adequate security should be provided for all examination materials and invigilators to avoid leakage of examination papers through violence or fraudulent means either before or during examination.

There should be proper identification of students before entry into the examination halls. This is very important to avoid any case of impersonation.

There should be a serious and aggressive campaign against examination malpractice in all higher institutions of learning in Nigeria. And installation of surveillance system (CCTV) should be provided if possible.

Adequate facilities, such as classrooms, lecture halls and laboratories should be provided to ensure effective checks and control of candidates during examination. Candidates that may be caught and found guilty of examination malpractice should be severely punished without fear or favour to serve as deterrent to others.

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Combined Effects of Thinkpair - Share and Blended Learning on Senior Secondary Schools Students' Performance in Geometry in Kogi State, Nigeria

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Abstract. This study investigated effects of Think Pair Share and Blended learning Strategies on Students' Academic Performances in Geometry in Senior Secondary Schools in Kogi State. Three research questions and three null hypotheses guided the study. The research adopted a pretest-posttest control group quasi-experimental design. The population comprised 12,703 SS II Mathematics students from public secondary schools, with a sample size of 344 (180 males and 164 females) students selected using a multi-stage sampling technique. One instrument Geometry Performance Test (GPT) was used for data collection. The instrument was face validated by three experts in Science Education Department (two experts from Mathematics Education Units/One expert from Measurement and Evaluation). In order to ensure the reliability of the instruments, 30 copies of GPT were trial tested on senior secondary school students that were not part of the sampled schools. The reliability of Geometry Performance Test (GPT) was determine using Kuder Richardson Formula 20 (K-R_{20}) and the reliability coefficient index 0.78 was obtained. The data collected was analyzed with respect to research questions and hypotheses. Mean and standard deviation was used in answering the research questions. For testing the null hypotheses formulated for the study, the analysis of covariance (ANCOVA) was used at 0.05 level of significance. The study found that the variation in students' academic performance in Geometry is significantly accounted for by the instructional strategies used. The results showed that both Think-Pair-Share and Blended Learning strategies significantly improved students' academic performance in Geometry compared to the conventional method. It was recommended that Parents should encourage their children to rely more on the scientific conception of the instructional strategies used in the geometry subject, thus discouraging them from holding on to their wrong believe towards Geometry and Mathematics teachers should use Think-pair Share and blended learning in teaching geometry.

Keywords: Think pair share, blended, learning Geometry, performance.

1. Introduction

Mathematics is an important tool which human cannot do without. It provides opportunity to inculcate permanent literacy in an individual as well as laying a sound foundation for scientific and reflective thinking. It also helps tremendously in solving of problems in Health, Agriculture, Finance, Education, Religion, Transportation, Communication, Power and Housing sectors of any nation (Enyonam, 2022). Mathematical application is a very important, one need good knowledge of mathematics in having a good degree in the following areas; Chemistry, Physics, Engineering, Biology, Pharmacy (Sunday etal, 2014). One of the primary subjects emphasized in Nigerian schools and globally is Mathematics, given its crucial role in various academic disciplines, especially in Science and Technology (Akinsolu, 2014). Mathematics is fundamental in daily life, serving as a necessary skill for routine activities and interpersonal interactions. Proficiency in Mathematics is essential for the study of Sciences, Technology, and Humanities. The secondary school mathematics curriculum aims to foster the development of fundamental mathematical skills, covering areas such as arithmetic, algebra, geometry, and statistics. Alongside skill acquisition, the curriculum emphasizes the cultivation of problem-solving and critical-thinking abilities through the practical application of mathematical concepts (National Council of Teachers of Mathematics

(NCTM), 2020). Additionally, the curriculum strives to deepen students' understanding of mathematical ideas and their real-world relevance, encouraging connections between theoretical knowledge and practical applications. Integration of technology tools, such as graphing calculators and computer software, is a key objective to enhance mathematical comprehension (Organisation for Economic Co-operation and Development (OECD), 2019).

Teachers employ a range of strategies to fulfill the curriculum objectives. Active learning plays a crucial role, with educators engaging students in hands-on activities, group work, and discussions. Problem-solving tasks and real-life applications are incorporated to make mathematical concepts more tangible and applicable. Differentiated instruction allows teachers to cater to the diverse learning styles and abilities of students, providing additional support or challenges based on individual needs. Integration of technology, such as online resources and educational software, enhances interactive learning experiences (Federal Ministry of Education (Nigeria), 2014, Boaler, 2016). In today's technology-driven landscape, foundational mathematical knowledge is paramount for developing technological literacy and digital fluency, empowering individuals to navigate and contribute meaningfully in this increasingly interconnected world (Kress, 2014). Additionally, geometry learning promotes growth mindset, encouraging resilience and positive attitude toward learning, not only in geometry but also in other subjects and life endeavors (Boaler & Dweck, 2016). Recent research underscores the crucial role of teacher quality and the importance of diverse mathematical experiences and real-world applications in creating supportive classroom environments that foster students' engagement, collaboration, and individual growth (Kraft, *et al.*, 2018; Cai & Jiang, 2019). Students' effectiveness is inherently linked to the competence of their teachers. According Suherman (2014) problem-solving ability include: (1) understand the problem, students can identify the elements that are known, where asked, and the adequacy of the required elements. (2) The settlement plan, construct a mathematical model, implement strategies to solve them. (3) Complete the planning and conclusions. With this think pair-share is one of the strategies to enhance positive increase in academic performance. Studies by Usman, *et al.,* (2017); Unamba, *et al.,* (2017); Ehiwario, *et al.,* (2021) revealed that new ideas and innovative instructional strategies that have proved effective in Mathematics are cooperative learning, problem-solving, Computer-Assisted Instruction (CAI) and Constructivism models, Blended learning and Think-Pair-Share (TPS).

Think-Pair-Share (TPS) is a cooperative learning strategy that offers significant benefits for secondary school students, particularly in enhancing their critical thinking and communication skills. Through the individual reflection phase ("think"), students engage in independent analysis of information, fostering critical thinking and problem-solving skills (Shadrina, 2014). Collaborative analysis in the "pair" phase allows students to compare approaches, identify inconsistencies, and refine their understanding through peer interaction, further strengthening critical thinking and communication abilities (Sejani, 2016). By articulating their reasoning and solutions during the "pair" and "share" phases, students develop strong communication skills, enabling them to express their ideas clearly and concisely (Liu & Hu, 2016). Active listening and respect for diverse viewpoints during discussions further enhance communication skills and create a more inclusive learning environment (Jumanta, 2014). Think-Pair-Share (TPS) strategy, created by Lyman (2016) and colleagues, is a cooperative learning approach involving three phases. Named after its sequential steps, TPS encourages individual and collaborative student engagement. It begins with individual contemplation on a topic, followed by the exchange of ideas with peers. Discussing with a partner enhances participation, focuses attention, and improves comprehension of reading materials. This cooperative strategy enhances the learning experience, affording students more time to ponder, react, and aid each other's understanding (Jumanta, 2014). As noted by Napitupulu and Surya (2017), think-pair share also encourages interaction and cooperation among students, potentially kindling an enhanced interest in Mathematics. Therefore, think – pair - share is very important for enhancing student's interest which in invariably may lead to high academic performance in the subject.

On the hand, blended learning, often referred to as hybrid learning, is an instructional approach that combines digital or online learning materials and activities with traditional face-to-face classroom methods. Blended learning, is a transformative educational approach that integrates traditional face-to-face instruction with the flexibility of online Bozkurt, *et al.,* (2015). This innovative blend has garnered significant research attention, consistently showing positive effects on student academic performance (Christenson, *et al.*, 2019). The approach holds great promise for enhancing learning in secondary schools, promoting critical thinking, and fostering problem-solving skills through active learning and collaboration (Means, *et al.*, 2014). Successful implementation necessitates careful

planning, design, and consideration of multiple factors. Key elements include well-defined learning objectives, structured online modules, and continuous support for both teachers and students. Moreover, access to technology, reliable internet connectivity, and appropriate learning software are indispensable components for the success of blended learning programs (Means & Murphy, 2014).

Wilson and Smilanich (2015) see blended learning as the implementation of the most effective learning solutions in a coordinated way to achieve the desired learning targets. Blended learning is a new type of education prepared for a group by combining the positive aspects of different learning approaches. Blended learning will provide a big convenience for the course to achieve its target by combining the face-to-face interaction in traditional learning and time, place and material richness provided by Web-based learning. Blended learning, a combination of online and face-to-face instruction, has become increasingly popular in recent times (Yang, 2016; Dziuban, *et al.*, 2018). This progressive method provides various advantages for students, educators, and institutions, positioning it as a crucial catalyst for personalized and efficient learning encounters.

The core of blended learning lies in its two components which include:

Online Learning: Leveraging technology, this component delivers interactive content, self-paced learning opportunities, and collaborative platforms (Dziuban, *et al.*, 2015; Park & Choi, 2019). Engaging video lectures, gamified learning activities, and adaptive learning technologies personalize the learning journey and cater to individual learning styles.

Face-to-Face Instruction: This component emphasizes social interaction personalized guidance, and deep learning through interactive discussions, hands-on activities, and individualized support (Yang, 2016; Hew & Cheung, 2015). Collaborative projects, Socratic dialogues, and formative assessments foster critical thinking, communication, and problem-solving skills.

Despite the curriculum's objectives and teaching approaches, both teachers and students encounter challenges. The abstract nature of certain mathematical concepts poses difficulties for students in grasping these ideas, prompting teachers to find effective ways to make abstract notions more concrete and relatable. Limited access to teaching resources, including textbooks and technology tools, poses a challenge for educators (Adediwaju, 2015). Teachers must address diverse learning needs within a heterogeneous classroom, where students may vary widely in mathematical preparedness and learning styles.

Studies have revealed contradictory findings on the correlation between students' gender and their performance in Mathematics. While some studies indicated that there is no statistically significant difference in the students' performance in Mathematics based on gender (Olorunnishola & Sunday, 2024; Samuel & Sunday, 2024). Some studies revealed that males performed significantly better than their female counterparts in Mathematics (Nematullah, *et al.*, 2015; Amogne, 2015). While Ganley and Lubienski (2016) were of the view that these differences could be as a result of female students being a 'good girl' in school by doing strictly only the things the class teacher asks them to do. Hence, they do not try out other creative or risky things that could enhance their problem-solving skills in Mathematics which Think-pair share and blended learning instructional strategies might have helped.
Hence this study investigated the combined effects of think-pair share and blended learning instructional strategies on students' performance in Geometry at the senior secondary schools.

1.1 Statement of the Problem

In Nigeria, there has been a persistent issue of low student academic performance in mathematics, particularly evident in the Senior School Certificate Examination (SSCE) results reported by the West African Examination Council (WAEC) Chief examiner from 2011 to 2023 (WAEC, 2023). This consistent trend reflects challenges in grasping fundamental concepts such as Geometry among upper secondary school students in Nigeria. Researchers identify factors contributing to mathematics education issues, including lack of interest, inactive learning, ineffective instruction, and a shortage of qualified teachers. Notably, think pair share and blended learning strategies are highlighted for investigation. The present study investigated the effect of think pair share and blended learning strategies on students' academic performances in geometry, specifically in the Kogi State. The research addresses the gap in the existing literature regarding the impact of these instructional approaches in the study area. The question guiding the study is formulated as follows: what is effect of think pair share and blended learning strategies on students' academic performances in Geometry in Kogi state Nigeria?

1.2 Research Questions

The following research questions guided the study:

- What is the difference in the mean scores of students when taught geometry using combined think pair share strategy and blended learning strategies and those taught with conventional method?
- What is the difference of male and female students mean scores when taught geometry using think pair share and Blended Learning?
- What are the mean interaction effects of mode of instructional strategies and gender on academic performance scores of students in Geometry?

1.3 Research Hypotheses

The following hypotheses were stated and was tested at 0.05 level of significance.

$H0_1$: There is no significant difference in the mean scores of students in mathematics when exposed to geometry using think-pair-share and blended learning and those taught using conventional method.
$H0_2$: There is no significant difference in the mean scores of male and female students taught geometry using think pair share and blended learning strategies.
$H0_3$: There is no significant interaction effect of instructional strategies and gender on academic performance of students in geometry.

2. Literature Review

2.1 Theoretical Framework

This research was grounded on theories relevant to this study. For the course of this study, the following theory was use; Constructivist theory of learning and Collaborative learning theory.

2.2 Constructivist Theory of Learning

The main proponent of Constructivist learning theory was Jerome Bruner in 1966. The theory proposes the idea that learners construct knowledge and meanings for themselves individually and socially during learning process. Constructivism learning theory describes learning as an approach where teacher provides learners with an opportunity to construct their own sense and meaning in interpretation of what is being learned (Bruner, 1966). Constructivism theory also helps the teacher in designing and utilization of learning materials that engage. Stimulate and support meaningful learning of Mathematics. This creates interest among students hence increasing enrolment and improve academic performance in Mathematics. Constructivist view the role of a teacher as that of a facilitator and a mediator where learning Constructivist theory of learning is a perspective in education that emphasizes the active role of learners in building their own understanding and knowledge of the world. This theory is based on the idea that learners actively construct meaning from their experiences, and learning is a process of assimilating new information into existing cognitive structures. The key principles of constructivism include the importance of prior knowledge, the role of social interaction, and the idea that learning is a dynamic, ongoing process.

In essence, the relevance of constructivism to the study of think pair share and Blended Learning in mathematics education extend beyond immediate academic outcomes. They encompass the cultivation of critical thinking skills, the promotion of self-directed learning, and the preparation of students for a lifelong journey of intellectual growth. By acknowledging the constructive nature of learning, educators can harness the potential of think pair share and Blended Learning to not only enhance interest and academic performances in mathematics but also instill a lasting passion for learning within the broader context of students' educational journeys.

2.3 Collaborative Learning Theory

The Collaborative Learning Theory is a process whereby a group (or groups) of individuals learn from each other by working together to solve a problem, complete a task, create a product, or share one's thinking. This theory is rooted in the work of Lev Vygotsky's (1934) social development theory and zone of proximal development, which highlighted the importance of communication and social interaction in learning. In 1972, Bruffee Kenneth introduced the learning method, Classroom Consensus Group, in which the teacher allocated students into groups and assigned them questions to answer or problems to solve together. This approach creates a community of learners, enhancing the collaborative aspect of the educational experience. Ultimately, the study explores how these collaborative strategies influence students' interest in mathematics and contribute to their academic performances, demonstrating the theory's application in the real-world context of secondary education. Think Pair Share, as a collaborative technique, embodies the theory by fostering interaction and shared knowledge construction. Through the process of individual thinking, paired discussion, and subsequent sharing with the entire class, students actively engage with one another,

contributing to a collaborative creation of understanding. Additionally, the integration of blended learning aligns with Collaborative Learning Theory by extending collaboration into the digital realm. The flexible and diverse nature of blended learning environments allows students to interact both online and in-person, accommodating different learning preferences. This approach creates a community of learners, enhancing the collaborative aspect of the educational experience. Ultimately, the study explores how these collaborative strategies influence students' interest in mathematics and contribute to their academic performances, demonstrating the theory's application in the real-world context of secondary education.

2.4 Empirical Studies

A study by Abiodun, *et al.*, (2022), examined the effect of the Think-Pair-Share strategy on student performance in secondary school science (Mathematics) in Ogun State Nigeria. Findings revealed that there is the main effect of the strategy on the student's performance in Geometry. Also, it was established that there is no significant effect of gender on the Geometry of the students in Mathematics. In another study by Akanmu, (2019), who examined the effects of think-pair-share on senior school students' performance in mathematics in Ilorin, Nigeria. Findings of the study showed: (i) a statistically significant difference in the performance of students taught set theory using think-pair-share compared with their counterparts in the control group in favour of think-pair-share group, (ii) no statistically significant difference in the performance of male and female students taught set theory in Mathematics using think-pair-share; (iii) no statistically significant difference in the performance of students taught set theory in Mathematics using think-pair-share based on scoring levels; and (iv) a statistically significant difference in the knowledge retained by students taught set theory in Mathematics using think-pair-share compared with their counterparts in the control group in favour of think-pair-share group. Another study by Mohammed and Sani, (2023), assess the Academic Performance and Interest in Algebraic Process using Think Pair Share Strategy among Secondary School Student's in Katsina Zonal Education Quality Assurance of Katsina state, Nigeria. The findings of the study led to the conclusion that, students taught algebra using Think-Pair-Share strategy performed significantly higher than their counterparts taught using lecture method. It was recommended that, the think Pair Share strategy should be incorporated into the teaching and learning of Mathematics at the Senior Secondary School level. The highlighted was similar to the current study because both studies utilize the Think-Pair-Share strategy. The use only Think-Pair-Share strategy, while the current study was a combination of Think Pair Share and Blended learning instructional strategies. The highlighted was conducted in Katsina State while the current study was conducted in Kogi State, Nigeria

In a study by Indrapangastuti, *et al.*, (2021), aims to discover the effectiveness of the blended learning model in mathematics learning to improve the performance of mathematical concepts. The results of this study showed that the blended learning model is significantly more effective than the conventional learning model in enhancing students' performance of mathematical concepts. Another study by, Tong, *et al.*, (2022), Individuals attempting to study remotely during the COVID-19 lockdown will find that blended learning is a helpful solution and results in a significant increase in learning engagement. The best benefits for teachers and students are obtained by maximizing the advantages of each teaching method and by combining the advantages of online and face-to-face instruction. The study confirmed that blended learning positively impacts students' academic performance in the experimental class compared with the control class as demonstrated by the outcomes.

Another study carried out by Attard, and Holmes, (2020), investigated the effectiveness of the "flex model" of blended learning on students' academic performance, self-study skills, and learning attitudes in the context of teaching the mathematical subtopic of coordinates in the plane. Additionally, observations and student opinions indicated that blended learning increased student interaction with teachers and improved self-study abilities and learning attitudes. However, due to time constraints, not all students in the experiment showed significant progress. This study suggests that blended learning can be a valuable tool for enhancing mathematics learning outcomes, particularly for specific subtopics like coordinate systems, by providing flexible access to learning materials and fostering student engagement. The highlighted study uses only blendedlearning strategy, in contrast, the current study utilizes both Think Pair Share and Blended Learning Strategies. The highlighted study was conducted Vietnam, abroad. The current study is conducted in Kogi State, Nigeria.

Another study by Ekanem and Ikonne, (2019) examined the influence of gender on academic performance in Mathematics among senior secondary school students in Bayelsa State. Result of the analysis revealed that there is a significant difference in the

Mathematics performance of the male and female students in favour of the males.
Hence this study investigated the effects of two instructional strategies while gender is a moderating variable.

3. Research Methodology

The research study employed a pretest-posttest control group quasi-experimental design to investigate the effect of two instructional strategies on academic performance and interest of students (Creswell, 2018). This design was chosen for its ability to assess the effectiveness of interventions by selecting groups with pre-existing characteristics (Achimugu *et al.,* 2024). The study consisted of two groups: experimental groups exposed to think pair share and Blended Learning and the Control group. Prior to the implementation of the instructional strategies, both groups were subjected to a pretest to measure their initial academic performance and interest levels. Subsequently, the designated instructional methods was applied, and posttests was administered to assess the changes. The comparison between the two groups provided valuable insights into the effectiveness of the instructional strategies, aiding in the evaluation of their effects on academic performance and interest levels. This quasi-experimental design offers a robust framework for discerning the relative merits of different teaching approaches in an educational setting.

The study was conducted in Kogi State. Kogi is a State in the North-Central Zone of Nigeria. The State shares common boundaries with Niger, Kwara, Nasarawa and the Federal Capital Territory to the North. To the East, the State is bounded by Benue and Enugu States, to the south by Enugu and Anambra States, and to the west by Ondo, Ekiti and Edo States (See Appendix B, page 112). In the State there are six education zones: Idah, Dekina, Ankpa, Lokoja, Okene and Kabba educational zones. The choice of Kogi State for the study arose because from literature available to the researcher, most of the research studies carried out on think pair share and blended learning strategies on students' interest and academic performance in geometry, were done outside State. The State consists three senatorial districts name; Kogi east, Kogi central and Kogi west (STETSCOM, 2024) (See Appendix C, page 113).

3.1 Population of the Study

The population of the study consists of 12703 (6,680 male and 6,023 female) senior secondary school two (SS II) Mathematics students from 254 public secondary schools in Kogi State, Nigeria. (Source: Kogi State Science, technical Education and teaching service commission, 2024). The sample for this study comprised of 344 (180 males and 164 females) senior secondary two (SS II) mathematics students. A multi-stage sampling technique was employed in the sampling procedures. Firstly, purposive sampling technique was used to select fours (4) schools from each senatorial district. Give a total of 12 secondary schools that were co-education schools. These schools were suitable for the study because: The schools were co-educational to carter for gender variable. Second stage, simple random sampling technique by toss of coin was used to select two schools each from each of senatorial district bringing a total of 6 schools. Thirdly, simple random sampling technique by lucky dip was used in assigning two schools each to the two experimental groups and the control group. At the class level, no sampling was done because intact classes was used. Each of the schools had two streams and all were used, the way they were.

One instrument that was used for data collection is Geometry Performance Test (GPT) which are widely recognized instruments in the field of educational research for assessing students' interest in geometry and their performance in the subject, respectively. Geometry Performance Test (GPT) was adopted from WAEC past questions that are already validated.

Geometry Performance Test (GPT), elicited information on students' Academic Performance in Geometry. This contains 40 questions with four response options (A, B, C and D to each question. These were taken from the West African Examination Council (WAEC) past questions. The test was a kind of structured type. This was to allow the students to express their ideas freely and intelligently. Both experimental groups were taught using lesson plans. The lesson plan for teaching the experimental groups was written based on the method under study. There were eight lesson plan notes for each group and these were for the five topics, which were used to teach during the period of experiment to both groups. The students had not been taught these topics before the experimental period. They were selected from the term's scheme of work.

The Geometry Performance Test (GPT) was already a validated instrument as it was adopted from WAEC past questions.

Reliability of the Instrument: Geometry Performance Test was trial tested on senior secondary school students that were not part of the sampled schools. Raw scores of the respondents obtained from Geometry Performance Test (GPT) was determine

using Kuder Richardson Formula 20 (K-R_{20}) and the reliability coefficient index of 0.88 was obtained
Permission was sought from appropriate authorities of the sampled schools using introduction letter from the department science education to get approval in order to sample students under their domains for the purpose of this research. The regular mathematics teachers were used in administering the Instruments. The GIS was administered once and collected at the spot. The GPT pre-test was administered to the subjects two weeks before the experiment. Scores obtained by the students on the pre-test were recorded and kept aside for use after the experiment. At the end of the experiment, a post-test was also given to the class to ascertain the effect of treatment. A week training session was organized within the school by the researcher for the regular Mathematics teachers in the experimental group on the already validated topics. During the training session the researcher exposed the teachers to how to use think-pair shape and Blended learning instructional strategies to teach Geometry for the teachers in the experimental groups while the control group were taught to using the conventional method. When the researcher made sure that the essential competencies had been acquired for the actual experimental treatment, the actual treatment was then conducted by the regular Mathematics teachers in both the experimental schools and control school. The lesson plans prepared by the researcher for each group were used by the teachers.

The teachers for the experimental groups used the think-pair share and Blended learning Instructional strategies while the teachers for the control group used the conventional method. The researcher monitored both groups at different periods to make sure that the teachers adhered strictly to the instruction in the lesson plan that was given to them. At the end of the experimental period, posttest was administered to the students. The data from both pre-test and posttest of both the experimental groups and control groups were collected and used for analysis. The Geometry Performance Test (GPT) was marked by the researcher. The scores obtained from the GPT was analyzed and used in answering the research questions and testing the hypotheses which guided the study.

3.2 Control of Some Extraneous Variables

The following procedures were adapted by the researcher to control some extraneous variables that might introduce bias into the study if they were not checked.

Novelty Effect
Novelty effect often occurs when students are working on a new material under a new teacher. The presence of a new teacher is likely to present a novelty effect on the students as a new teacher with a new method. To avoid this teacher bias, the students were taught by their regular Mathematics teachers who had taken part in the training session organized by the researcher. In view of this arrangement, the researcher was not involved in the administration of the experimental conditions.

Teacher Factor
No two individuals are exactly the same in skill and method. In order to control the errors that may surface due to differences among teachers, the researcher organized a uniform training programme for the teachers that were involved in the experiment. The objective of the training was to enable the teachers to acquire the competencies for carrying out the research conditions. The content of the training programme included a proper knowledge of the content/subject matter, performance objectives and students' activities with regard to the topics. The researcher was in close contact with the teachers during the period of experiment and discussion on the lesson plans and various students' activities with a view to ensuring that the teachers implemented what they learned from the training. By using the time tables of the school involved in the study, the researcher monitored the classes regularly to make sure that a uniform procedure of instruction was strictly adhered to by all the teachers concerned.

Test Effect
To control the continuous testing effect, the researcher administered the pre-test during mid-term test while the post test took place during the end of the term examination. In this way, students did not feel that they were taking part in any study.

Initial Group difference
As intact classes were used for the study, the control for nonequivalence of the classes was established by the use of the analysis of covariance (ANCOVA) to partial out the initial differences among the subjects.

3.3 Method of Data Analysis

Mean and standard deviation was used in answering the research questions. For testing the null hypotheses formulated for the study, the analysis of covariance (ANCOVA) was used at 0.05 level of significance. This is because ANCOVA is suitable in an experimental research design in other to control initial differences among the research subjects due to the use

of intact classes. The null hypotheses were rejected if the key P-value in each case is less than 0.05 but will not be rejected if otherwise.

4. Presentation of Results

Research Question 1: What is the difference in the mean score of students when taught Geometry using think pair share, blending learning strategy and those taught using conventional method?

Table 1: Pretest/Posttest Mean Scores of Students Taught Geometry using Think Pair Share and Blended Learning Strategy and those taught using Conventional Method

		Pre test		Posttest		
Method	N	$\bar{X}$	SD	$\bar{X}$	SD	Mean gain
Think-pair share	109	44.35	8.99	62.99	6.41	18.64
Blended Learning	115	38.81	8.76	58.47	8.01	19.66
Conventional Method	120	33.76	10.99	40.95	8.54	7.19

Result on Table 1 showed the pre-test and post-test mean academic performance scores of students taught Geometry using think pair share, blended learning strategy and conventional method. The result of the study showed that the students who were taught Geometry using Think-pair share instructional strategy had mean performance score of ($\bar{X}$= 44.35, SD = 8.99) at the pretest and mean performance score of ($\bar{X}$= 62.99, SD = 6.41) at the posttest, the mean gain score was 18.64. Also, the students taught the same topics using blended learning strategy had the mean performance score of ($\bar{X}$= 38.81, SD = 8.76) at pretest and mean performance score of ($\bar{X}$= 58.47, SD = 8.01) at posttest with a mean gain score of 19.66. Furthermore, the students taught Geometry using conventional method had a pretest mean performance score of ($\bar{X}$= 33.76, SD = 10.99) and posttest performance mean score of ($\bar{X}$= 40.95, SD = 8.54) with mean gain of 7.19. The higher mean gain scores of 18.64 and 19.66 for think-pair share and blended learning strategy groups respectively showed that think-pair share and blended learning instructional strategies improved students' academic performance more than conventional method with blended learning strategy proving more efficacious. Implying that think-pair share and blended learning strategies had positive effect on the mean academic performance scores of students in Geometry. This further implies that the treatment was effective. The closeness of SD varies in the three groups indicate that the respondents were homogenous in their responses to interest items.

Research Question 2: What is the difference of male and female students' mean scores when taught geometry using think pair share and blended learning?

Table 2: Pretest/Posttest of the Mean Scores of Male and Female Students Taught Geometry Using Think Pair Share and blended learning Strategies

		Pretest		Posttest			
Gender	N	$\bar{x}$	SD	$\bar{x}$	SD	Mean Gain	Mean Difference
Male	160	31.88	7.20	56.50	3.51	24.62	14.27
Female	184	42.83	10.40	53.18	9.53	10.35	

Result in Table 2 showed the influence of gender on the mean academic performance of students' taught geometry using think pair share strategies. Result showed that male students had pretest mean academic performance score of ($\bar{x}$ =31.88, SD = 7.20) and a post-test mean academic performance score of ($\bar{x}$ = 56.50, SD = 3.51), while the female students had a pretest mean academic performance score of ($\bar{x}$ =42.83, SD = 10.83) and a posttest mean academic performance score ($\bar{x}$ = 53.18, SD = 9.53). Result showed that the male students performed higher than their female counterparts with mean gain of 24.62while the female students had mean gain of 10.35 resulting to a mean difference of 14.27 in favour of the male counterpart.

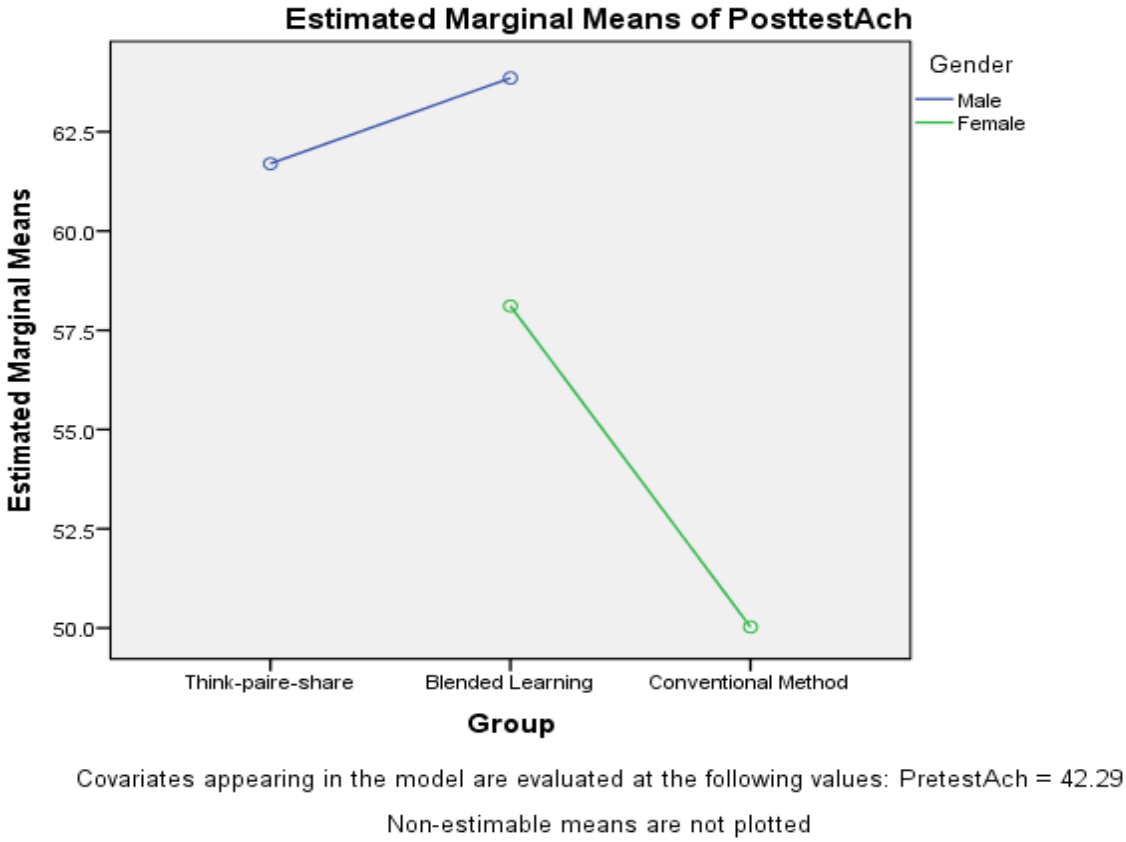
Research Question 3: What are the mean interaction effects of mode of instructional strategies and gender on academic performance of students in Geometry?

Table 3: Pretest/Posttest of the Mean Interaction Effects of Mode of Instructional Strategies and Gender on Academic Performance Scores of Students in Geometry

Instructional Strategies	Gender	N	Pre test $\bar{X}$	SD	Posttest $\bar{X}$	SD	Mean gain
Think-pair Share	Male	48	35.91	4.64	63.28	4.73	27.37
	Female	61	31.35	2.98	52.48	4.64	21.13
Blended Learning	Male	55	37.21	4.02	58.24	3.69	21.03
	Female	60	38.89	3.53	56.66	4.48	17.77
Conventional Method	Male	57	30.41	4.52	45.28	4.63	14.87
	Female	63	28.11	3.23	40.65	4.47	12.54

Result in Table 3 showed mean interaction effects of mode of instructional strategies and gender on academic performance scores of students in Geometry. Result showed that after the treatment, the male and female students taught Geometry using Think-pair share strategy had the academic performance mean gains of 27.37 and 21.13 respectively. The male and female students taught Geometry using Blended learning strategy had academic performance mean gains of 21.03 and 17.77 respectively, while the male and female students taught the same topics with conventional method had the academic performance mean gains of 14.87 and 12.24 respectively. These imply that male students showed greater academic performance with higher gain scores in all the three groups. To test for the significant interaction effect of instructional strategy and gender on students' mean academic performance scores in Geometry, see hypothesis eight. The Standard deviation presented in Table 8 above show that the interaction effect of teaching strategies among the three groups are relatively low judging from the amount of variation of values in their mean performance score and gender on students' academic performance in Geometry taught in this study. This is because of the homogeneity of items response among the male and female students in Geometry. This result is further explained using an interaction graph in Figure 2 which showed that there was no significant interaction effects of instructional strategies and gender on students' mean academic performance scores in Geometry. This is evidenced in the graph as the lines representing instructional strategies and gender did not intercept at a point as shown in the graph below

Fig. 1: Graph showing the interaction effect of instructional strategies and gender on students' interest.



Ho_2: There is no significant difference in the mean academic performance scores of students in geometry when exposed to geometry using think-pair-share, blended learning and conventional instructional strategies.

Table 4: Analysis of Covariance (ANCOVA) of Difference in the Mean Academic Performance Scores of Students in Geometry When Exposed to Think-Pair-Share, Blended Learning and Conventional Instructional Strategies

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared	Decision
Corrected Model	17477.982[a]	2	8738.991	259.463	.000	.603	
Intercept	20962.280	1	20962.280	622.377	.000	.646	
PretestPerf	10659.228	1	10659.228	316.476	.000	.481	S
Methods	6981.622	1	6981.622	207.287	.000	.378	S
Error	11485.227	341	33.681				
Total	1157590.000	344					
Corrected Total	28963.209	343					

Note: S = Significant, NS = Not Significant and η^2_p = partial eta squared

The result in Table 4 showed the ANCOVA of the difference in the mean academic performance scores of students in geometry when exposed to think-pair-share strategy, blended learning instructional strategy and conventional method. The result was statistically significant at (F) =207.287, p= 0.00, η^2_p = 0.378). Since the associated probability value of 0.00 is less than 0.05 set as level of significance, the null hypothesis was rejected. Thus, inference drawn is that there was a statistically significant difference in the mean academic performance scores of students in geometry when exposed to think-pair-share strategy, blended learning instructional strategy and conventional method in favour of the treatment groups with high mean. The result further showed the effect size (η^2_p = 0.38), which indicates that thirty eight percent (38%) variance in the mean academic performance scores of students in geometry when exposed to think-pair-share can be explained by blended learning instructional strategy.

Ho_4: There is no significant difference in the mean scores of male and female students taught geometry using think pair share and blended learning strategies.

Table 5: Analysis of Covariance (ANCOVA) of the Difference between the Mean Scores of Male and Female Students Taught Geometry Using Think Pair Share and blended learning Strategies

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Squared	EtaDec.
Corrected Model	18182.685[a]	3	6060.895	191.151	.000	.628	
Intercept	20434.684	1	20434.684	644.476	.000	.655	
Pretest Perf	11279.393	1	11279.393	355.734	.000	.511	
Methods	.421	1	.421	.013	.908	.000	
Gender	704.703	1	704.703	22.225	.000	.061	S
Methods*Gender	.000	0	.000	.530	.690	.150	NS
Error	10780.524	340	31.707				
Total	1157590.000	344					
Corrected Total	28963.209	343					

Note: S = Significant, NS = Not Significant and η^2_p = partial eta squared

The result in Table 5 showed the ANCOVA of the difference between the mean academic performance of male and female students taught geometry using think pair share strategy. The result was statistically significant at (F) = 22.23, p= 0.000, η^2_p = 0.061). Since the associated probability value of 0.000 is less than 0.05 set as level of significance, the null hypothesis was rejected. Thus, inference drawn is that there was a statistically significant difference betweenthe mean academic performance of male and female students taught geometry using think pair share strategy in favour of the male with higher mean scores. The result further showed the effect size (η^2_p = 0.061), which indicates that sixty-one percent (61%) variance in the mean academic performance of male and female students taught Geometry using think pair share can be explained by other factors.

5. Summary of the Findings

From the analysis of data and interpretation of results, the following findings emerged:

The finding of the study showed that there was a statistically significant difference in the mean academic performance scores of students in geometry when exposed to think-pair-share strategy, blended learning instructional strategy and conventional method in favour of think-pair-share strategy and blended learning instructional strategy that had higher means. The findings further showed with the aid of post-hoc analysis that think-pair is better compare to blended learning strategy.

The finding of the study showed that there was a statistically significant difference betweenthe mean academic performanceof male and female students taught geometry using think pair share strategy in favour of male that had higher mean ratings.

The finding of the study showed that there was no statistically significant interaction effect of instructional strategies and gender on academic performance of students in Geometry.

6. Discussion of Results

The result showed that students who were taught geometry using think pair share strategy had higher mean academic performance score than the group taught blended learning strategy. This implied that, think pair share strategy had a significant effect on geometry students than the blended learning strategy. The finding of the study is also supported by the test of hypothesis two which found that, there was a statistically significant difference in the mean academic performance of students in geometry when exposed to think-pair-share and blended learning instructional strategies. This implied that thirty eight percent (38%) variance in the mean the academic performance scores of students in geometry when exposed to think-pair-share and blended learning strategic can be explained by conventional instructional method. Think-Pair-Share (TPS) and blended learning strategies have several features that contribute to their superiority over conventional teaching methods. One of the key advantages of TPS is its promotion of active engagement. In TPS, students first think individually about a problem, then discuss their thoughts with a partner, and finally share their conclusions with the class. This structured approach ensures that all students are actively involved in the learning process, which fosters deeper understanding and retention of the material. The collaborative nature of TPS also enhances social interaction and communication skills, as students learn to articulate their ideas and listen to others' perspectives.

Blended learning, on the other hand, offers unparalleled flexibility and personalization in education. By combining online educational materials with traditional face-to-face instruction, blended learning allows students to access content at their own pace and according to their personal learning styles. This approach accommodates diverse learners and can be particularly beneficial for students who need more time to grasp complex concepts. Additionally, the use of multimedia and interactive content in blended learning keeps students engaged and makes learning more dynamic. The integration of technology also enables immediate feedback through online assessments, helping students to quickly identify and address their mistakes.

Both TPS and blended learning also excel in developing higher-order thinking skills and providing a supportive learning environment. TPS encourages critical thinking and problem-solving as students analyze and discuss various solutions with their peers. This peer-to-peer interaction not only reinforces their understanding but also builds confidence, as students feel more comfortable sharing ideas in smaller groups before presenting to the entire class. Blended learning, with its mix of online and offline activities, offers opportunities for personalized feedback and continuous assessment, allowing teachers to tailor instruction to meet the specific needs of each student. In contrast, conventional methods often rely on passive learning and a one-size-fits-all approach, which can limit student engagement and the development of essential skills. This finding agrees with Indrapangastuti *et al.,* (2021) who investigated on the effectiveness of the blended learning model in geometry learning to improve the performance of mathematical concepts and found that blended learning model is significantly more effective than the conventional learning model in enhancing students' performance of mathematical concepts. This means that the application of blended learning in geometry learning can significantly improve students' performance of mathematical concepts. The finding is in consistent with Tong *et al*., (2022) who found a significant difference on students' academic performance in the experimental class compared with the control class. The finding of the study is not in agreement Mukuka, *et al.,* (2021) who found that students had mixed experiences with remote blended learning on academic performance in geometry. This finding agreed with Abiodun, *et al.,* (2022) who investigated the effect of think pair share on students' academic performance in mathematics and found out that there was a main significant effect of the strategy on mathematics than the conventional method. This means that the application of think pair share in

geometry learning can significantly improve students' academic performance. This finding is in consistent with Akanmu (2019) who examined the effect of think pair on senior school students' performance in mathematics and found that there was a statistically significant difference in the performance of student taught set theory using think pair share strategy compared to their counterpart in the control group in favour of think pair share strategy group. This study also supported Mohammed and Sani (2023) who examined academic performance and interest in algebraic process using think pair share strategy among secondary school students and found out that the students taught algebra using think pair share strategy performed significantly higher than their counterpart in conventional method. The above showed that think-pair share improved student's academic performance when taught using think-pair share strategy

Result showed that male students performed higher in academic performance than their female counterparts' geometry. The finding of the study is also supported by the test of hypothesis four which found that, there was no statistically significant difference between the mean academic performance of male and female students taught geometry using think pair share and blended learning strategy in favour of male counterparts. This implied that fifteen percent (15%) variance in the mean academic performance of male and female students taught geometry using think pair share can be explained by blended learning instructional strategy. The finding of the study is in disagreement with Oribhabor (2020) who examined the influence of gender on academic performance in Geometry among senior secondary school students in Bayelsa State and found a significant difference in the Mathematics performance of the male and female students in favour of the males when taught with think-pair share strategy. The finding is also disagreed with Adeyemo *et al.,* (2021) who investigated on the effect of student gender on interest and their performance in mathematics and found a significant effect between male and female students' interest and their performance in mathematics when they are exposed to blended learning strategy. The finding of the study was in agreement with Allahnana, and Usman (2018) who investigated on the relationship between gender, interest in mathematics, and mathematics performance among secondary school students in Keffi Local Government Area of Nasarawa State, Nigeria and found no significant difference between male and female academic performance in mathematics.

The result showed that male students' interaction effect mean academic performance is higher than their female counterparts in geometry. The finding of the study is also supported by the test of hypothesis eight which found that, there was no statistically significant interaction effect of instructional strategies and gender on students' academic performance in geometry. The finding agrees Abiodun *et al.,* (2022) who researched and found that there is no significant main effect of gender on the performance of the students in Mathematics. The finding agrees with Guiso *et al.,* (2020) who researched on gender differences in the interest and academic performance in mathematics schoolwork across 50 Countries and found no gender interaction in mathematics performance. The finding was in disagreement with Ekanem and Ikonne, (2019) who examined the influence of gender on academic performance in Mathematics among senior secondary school students in Bayelsa State and found that interaction effect of gender on students' academic performance in mathematics. Hence, gender has a substantial influence on students' academic performance in mathematics.

7. Conclusion

The finding of the study showed that there was a statistically significant difference in the mean interest ratings of students in geometry when exposed to think-pair-share strategy, blended learning instructional strategy and conventional method in favour of think-pair-share and blended learning strategies with think pair share strategies having significant lead after post hoc analysis. The finding of the study also, showed that there was a statistically significant difference in the mean academic performance scores of students in geometry when exposed to think-pair-share strategy, blended learning instructional strategy and conventional method in favour of two experimental groups with think-pair share strategy having significant lead based on the post-hoc analysis. The finding of the study showed that there was a statistically significant difference between the mean interest ratings of male and female students taught geometry using think pair share strategy in favour of the male counterpart. The finding of the study showed that there was no statistically significant difference between the mean academic performance of male and female students taught geometry using think pair share strategy. The finding of the study showed that there was no statistically significant interaction effect of instructional strategies and gender on students' interest ratings in geometry. Furthermore, the finding of the study showed that there was no statistically significant interaction effect of instructional strategies and gender on academic performance of students in geometry.

8. Recommendations

The following recommendations were made according to the findings of the study:

Parents should encourage their children to rely more on the scientific conception of the instructional strategies used in the geometry subject, thus discouraging them from holding on to their wrong beliefs towards Geometry.

Geometry teachers should ensure that the various terminologies in the subject are sufficiently explained to students with scientific justifications in order to dissuade students from relying on their wrong beliefs towards Geometry.

Parents and teachers should help correct the wrong notions held by male and female students about Geometry subject.
Curriculum planners should include scientific justifications against the various instructional strategies used in teaching and learning of geometry.

Government through the federal and state ministries of education should provide the required instructional materials to enhance both male and female students' understanding of the various terminologies in Geometry.

It is also recommended that both think-pair share and blended learning strategy should be used in teaching geometry since it improved students' academic performance in geometry.

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Creative Expression as an Emotional Scaffold: Alleviating Affective Barriers in Second Language Acquisition in Tertiary Institutions

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Abstract. Affective barriers such as anxiety, fear of negative evaluation, low self-confidence, and communication apprehension continue to hinder effective second language acquisition among students in tertiary institutions. This study examined creative expression as an emotional scaffold for alleviating affective barriers in second language acquisition among undergraduate students in selected Nigerian tertiary institutions, including the University of Lagos, University of Ibadan, and Federal College of Education, Abeokuta. The study adopted a mixed-methods descriptive survey design involving 240 undergraduate students studying French, English, Arabic, and other language-related courses. Data were collected through structured questionnaires and semi-structured interviews, while quantitative data were analyzed using descriptive statistics and qualitative responses were thematically analyzed. Findings revealed that creative expression through drama, music, storytelling, poetry, role-play, painting, and digital creative activities significantly reduced learners' anxiety levels and improved emotional engagement during language learning processes. Students reported increased classroom participation, enhanced communication confidence, improved pronunciation practice, and greater willingness to interact in the target language. The findings further indicated that creative arts activities fostered collaborative learning environments that minimized fear of making mistakes and encouraged spontaneous language use. Despite these positive outcomes, challenges such as inadequate instructional resources, insufficient lecturer training, rigid curriculum structures, and limited institutional support affected the effective implementation of arts-based language pedagogies. The study concludes that creative expression functions as an important emotional scaffold capable of supporting learners psychologically and academically during second language acquisition. It therefore recommends the integration of arts-based pedagogical approaches into tertiary language curricula, professional training for language educators in creative instructional methods, and increased institutional support for interdisciplinary teaching practices.

Keywords: Creative expression, emotional scaffold, affective barriers, second language acquisition, arts-based pedagogy, tertiary institutions

1. Introduction

The increasing globalization of education, commerce, diplomacy, and technology has made second language acquisition an essential component of higher education across the world. In multilingual societies such as Nigeria, proficiency in additional languages has become increasingly important for intercultural communication, academic advancement, international mobility, and professional competitiveness. Consequently, tertiary institution students are encouraged to acquire competence not only in English but also in foreign and indigenous languages such as French, Arabic, Chinese, Hausa, Igbo, and Yoruba. However, despite the growing importance of multilingual competence, many learners encounter emotional and psychological barriers that hinder effective language acquisition.

Research in second language acquisition has consistently shown that emotional variables significantly influence language learning outcomes. Krashen (1982), in his Affective Filter Hypothesis, argued that "performers with high motivation and self-confidence and a good self-image, and a low level of anxiety are better equipped for success in second language acquisition" (p. 31). This implies that learners' emotional states directly affect their ability to internalize and produce language effectively. When learners experience fear, tension, embarrassment, or low self-confidence, their

affective filters become elevated, thereby obstructing meaningful language acquisition.

Among the various emotional factors affecting language learning, anxiety remains one of the most widely studied and influential. Horwitz et al. (1986) defined foreign language anxiety as "a distinct complex of self-perceptions, beliefs, feelings, and behaviors related to classroom language learning arising from the uniqueness of the language learning process" (p. 128). This form of anxiety often manifests through nervousness during oral communication, fear of negative evaluation, reluctance to participate in classroom interaction, and apprehension toward pronunciation exercises and public speaking tasks. MacIntyre and Gardner (1994) further explained that language anxiety "can interfere with the cognitive processing of language input, retention, and production" (p. 284), thereby limiting learners' communicative competence and academic performance.

In many Nigerian tertiary institutions, second language instruction is still largely characterized by traditional teacher-centered pedagogies that emphasize grammatical accuracy, memorization, and formal testing. Although these methods may support theoretical language knowledge, they often create highly evaluative classroom environments that intensify learners' fear of making mistakes. Students frequently perceive language classrooms as spaces where errors are criticized rather than viewed as part of the learning process. Such experiences may weaken learners' confidence and reduce their willingness to communicate in the target language.

The importance of emotional support in learning environments has therefore become a central concern in contemporary educational discourse. Vygotsky (1978) emphasized that learning is fundamentally social and occurs through supportive interactions within culturally meaningful contexts. According to Vygotsky, "what a child can do with assistance today she will be able to do by herself tomorrow" (p. 87). This perspective highlights the importance of scaffolding in facilitating learning processes. Building on this idea, emotional scaffolding refers to instructional practices that provide emotional encouragement, psychological safety, and supportive engagement to learners during academic activities (Rosiek, 2003). Emotional scaffolding is particularly relevant in second language acquisition because language learning often exposes learners to vulnerability, self-consciousness, and fear of public mistakes.

Within this framework, creative expression through the arts has emerged as a potentially transformative pedagogical strategy capable of reducing affective barriers in language learning environments. Creative expression involves the use of imaginative and artistic activities such as drama, storytelling, poetry, music, dance, painting, digital media creation, and role-play to communicate ideas, emotions, and experiences. Arts-based pedagogies encourage participation, experimentation, collaboration, and self-expression, thereby creating emotionally supportive learning spaces that may alleviate anxiety and improve learner confidence.

Eisner (2002) argued that "the arts teach children that problems can have more than one solution and that questions can have more than one answer" (p. 70). This flexibility and openness inherent in artistic engagement may reduce learners' fear of failure by shifting attention away from rigid linguistic perfection toward creative communication and meaning-making. Similarly, Greene (1995) maintained that the arts enable learners to "release imagination" and develop deeper personal engagement with learning experiences (p. 19). Through creative participation, learners are able to explore language in less threatening and more emotionally supportive contexts.

Drama-based activities, in particular, have been recognized as effective tools for reducing anxiety in language classrooms. Maley and Duff (2005) observed that drama "helps learners to develop emotional intelligence, self-awareness, confidence, spontaneity, and social interaction skills" (p. 6). Through role-play and performance, students can practice language naturally while temporarily distancing themselves from personal fear and self-consciousness. Likewise, music and poetry have been associated with emotional relaxation, memory retention, and pronunciation improvement. According to Medina (2002), music facilitates language learning by enhancing "motivation, memory, attention, and emotional engagement" (p. 3).

Recent scholarship has increasingly emphasized the relationship between positive emotional experiences and successful language acquisition. Gregersen and MacIntyre (2014) argued that "language teachers need to focus not only on reducing negative emotions but also on building positive emotional experiences that foster resilience and confidence" (p. 12). This suggests that emotionally responsive pedagogies can contribute significantly to learners' communicative competence and psychological well-being. Creative expression offers opportunities for such emotionally enriching experiences by encouraging collaborative participation and reducing the fear associated with formal classroom communication.

In the Nigerian educational context, some tertiary institutions have begun integrating creative arts

activities into second language instruction. At the University of Lagos, French language lecturers have reportedly incorporated drama and role-play into oral communication classes to improve students' fluency and classroom participation. Similarly, storytelling and poetry recitation have been used at the University of Ibadan to encourage pronunciation practice and learner interaction. At the Federal College of Education, Abeokuta, collaborative music performances and digital creative presentations have been introduced in selected language courses to enhance students' emotional engagement and confidence during communication exercises. These practical examples indicate growing recognition of arts-based pedagogies as supportive instructional approaches within Nigerian tertiary education.

Despite increasing scholarly attention to learner-centered pedagogies, empirical studies examining creative expression specifically as an emotional scaffold for alleviating affective barriers in second language acquisition remain relatively limited, particularly in African higher education contexts. Most existing studies have examined language anxiety, communicative competence, or arts-based learning independently, with insufficient attention given to the intersection between creative expression, emotional support, and second language acquisition. This gap underscores the need for further empirical investigation into how creative expression can support learners emotionally while enhancing language acquisition processes in tertiary institutions.

This study therefore investigates creative expression as an emotional scaffold for alleviating affective barriers in second language acquisition among students in selected Nigerian tertiary institutions. Specifically, the study examines the forms of creative expression used in second language classrooms, explores their influence on learners' emotional experiences, and assesses their effectiveness in reducing anxiety and promoting communicative confidence during language learning activities.

1.1 Statement of the Problem

Second language acquisition continues to pose significant challenges for many students in Nigerian tertiary institutions despite the growing importance of multilingual competence in contemporary education and global communication. Although students are encouraged to study foreign and indigenous languages for academic, professional, and intercultural purposes, many learners experience emotional and psychological difficulties that negatively affect their language learning experiences. Anxiety, fear of making mistakes, low self-confidence, communication apprehension, and fear of negative evaluation often prevent students from participating actively in classroom interactions and oral communication activities.

In many tertiary institutions, second language instruction still relies heavily on conventional teaching approaches that emphasize grammatical accuracy, rote memorization, written exercises, and formal assessment. While these approaches may contribute to theoretical understanding of language structures, they often fail to create emotionally supportive and interactive learning environments capable of addressing learners' affective needs. As a result, students frequently become passive participants in language classrooms and develop negative attitudes toward second language learning.

Furthermore, many language classrooms provide limited opportunities for creative participation, collaborative interaction, and self-expression. Learners are often evaluated primarily on correctness rather than communicative engagement, thereby increasing classroom tension and reducing learners' willingness to experiment with language use. This situation contributes to persistent affective barriers that hinder effective language acquisition and communication competence among students.

Recent educational practices increasingly emphasize the importance of learner-centered pedagogies that support both cognitive and emotional development. Creative expression through activities such as drama, storytelling, music, poetry, role-play, drawing, and digital media creation has shown potential for promoting learner engagement, confidence, and emotional comfort in educational settings. However, despite the growing relevance of arts-based instructional approaches globally, their integration into second language teaching within Nigerian tertiary institutions remains limited.

In addition, existing studies within the Nigerian educational context have focused largely on second language anxiety, language performance, and teaching methodologies without giving sufficient attention to the role of creative expression as an emotional scaffold for reducing affective barriers in second language acquisition. There is therefore inadequate empirical evidence on how arts-based creative activities can support learners emotionally and improve their participation, confidence, and communication experiences during language learning processes in tertiary institutions.

This study therefore seeks to fill this gap by investigating creative expression as an emotional scaffold for alleviating affective barriers in second language acquisition among students in selected

Nigerian tertiary institutions. The study aims to provide empirical evidence on the effectiveness of arts-based creative practices in reducing anxiety and enhancing learners' emotional engagement and communicative confidence in second language classrooms.

1.2 Objectives of the Study

The main objective of this study is to investigate creative expression as an emotional scaffold for alleviating affective barriers in second language acquisition among students in selected Nigerian tertiary institutions.

The specific objectives are to;

- examine the nature and extent of affective barriers experienced by students during second language acquisition in tertiary institutions.
- identify the various forms of creative expression used in second language learning among students in selected Nigerian tertiary institutions.
- determine the influence of creative expression on reducing anxiety and communication apprehension among second language learners.
- examine the extent to which creative expression enhances learners' confidence, motivation, and participation in second language classrooms.
- investigate students' perceptions of arts-based instructional strategies in second language acquisition.
- identify the challenges associated with integrating creative expression into second language teaching and learning in tertiary institutions.

1.3 Research Hypotheses

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

H_{01}: There is no significant relationship between creative expression and the reduction of affective barriers among second language learners in tertiary institutions.
H_{02}: Creative expression does not significantly influence students' confidence and participation in second language classrooms.
H_{03}: There is no significant difference in the anxiety levels of students exposed to arts-based instructional strategies and those taught through conventional teaching methods in second language acquisition.

2. Literature Review

2.1 Concept of Second Language Acquisition

Second language acquisition refers to the process through which individuals learn a language other than their native or first language. It involves the development of listening, speaking, reading, and writing competencies in the target language through formal instruction, interaction, and exposure. Second language acquisition has become increasingly important in contemporary education due to globalization, migration, intercultural communication, and international academic mobility.

Ellis (1997) described second language acquisition as the way in which people learn a language "other than their mother tongue, inside or outside of a classroom" (p. 3). This process is influenced by cognitive, social, emotional, environmental, and pedagogical factors. Similarly, Lightbown and Spada (2013) noted that successful language acquisition depends not only on intellectual ability but also on learners' motivation, confidence, emotional state, and opportunities for meaningful interaction.

In multilingual societies such as Nigeria, second language acquisition plays an essential role in educational advancement and social integration. Nigerian tertiary institutions offer courses in foreign languages such as French, Arabic, and Chinese alongside indigenous languages and English language studies. However, many students experience difficulties in oral communication and classroom participation due to emotional barriers associated with language learning. These challenges have increased scholarly interest in pedagogical strategies capable of supporting learners emotionally while enhancing language competence.

2.2 Affective Barriers in Second Language Acquisition

Affective barriers refer to emotional and psychological factors that interfere with effective learning processes. In second language acquisition, affective barriers commonly include anxiety, fear of negative evaluation, low self-esteem, communication apprehension, lack of motivation, and fear of making mistakes. These emotional challenges can reduce learners' willingness to participate actively in classroom interactions and negatively affect language performance.

Krashen's (1982) Affective Filter Hypothesis remains one of the most influential explanations of the relationship between emotion and language acquisition. Krashen argued that learners with low

motivation, low self-confidence, and high anxiety are less likely to process language input effectively because emotional tension acts as a mental filter that blocks acquisition. According to Krashen, emotional variables may either facilitate or hinder language learning depending on the learning environment and learners' psychological conditions.

Foreign language anxiety has been identified as one of the most significant affective barriers in language learning. Horwitz et al. (1986) explained that language anxiety is associated with learners' self-perceptions, beliefs, and emotional reactions within classroom settings. Learners experiencing language anxiety often avoid speaking activities, fear public embarrassment, and become reluctant to communicate in the target language.

MacIntyre and Gardner (1994) further observed that language anxiety affects cognitive processing by interfering with learners' ability to retain vocabulary, comprehend messages, and produce language effectively. Anxiety may therefore weaken both academic performance and communicative competence. In many tertiary institutions, students experience heightened anxiety during oral presentations, pronunciation exercises, and spontaneous conversations because they fear criticism from lecturers and peers.

Research within Nigerian educational contexts has similarly shown that affective barriers significantly influence language learning outcomes. Many students perceive second language classrooms as intimidating environments where mistakes are associated with ridicule or poor academic judgment. This perception often discourages learners from participating actively during classroom communication exercises.

2.3 Concept of Creative Expression

Creative expression refers to the use of imagination, artistic activities, and innovative forms of communication to express thoughts, emotions, experiences, and ideas. It encompasses activities such as drama, storytelling, music, dance, poetry, painting, drawing, role-play, and digital media creation. Creative expression encourages experimentation, collaboration, emotional engagement, and self-discovery within learning environments.

Eisner (2002) emphasized that the arts contribute significantly to human understanding by encouraging imagination, interpretation, emotional sensitivity, and reflective thinking. According to Eisner, artistic experiences enable learners to explore multiple perspectives and develop flexible ways of thinking. Similarly, Greene (1995) argued that creative activities stimulate imagination and help learners engage more meaningfully with educational experiences.

Within educational contexts, creative expression promotes active participation rather than passive reception of information. Learners become co-creators of knowledge through collaborative and experiential activities that encourage communication and personal involvement. Creative expression also provides opportunities for emotional release and confidence building, particularly among students who may feel anxious or insecure in traditional classroom settings.

In language education, creative expression allows learners to practice communication in more natural and less threatening contexts. Through drama, storytelling, music, and role-play, students interact with language meaningfully while focusing less on fear of grammatical imperfection. Consequently, creative activities may reduce classroom tension and encourage spontaneous language use.

2.4 Emotional Scaffolding and Learning

The concept of scaffolding originates from sociocultural learning theory, particularly the work of Vygotsky (1978), who emphasized the importance of supportive interaction in cognitive development. Scaffolding refers to instructional support provided to learners as they acquire new skills and knowledge. Emotional scaffolding extends this concept by focusing on emotional encouragement, psychological safety, and supportive engagement during learning processes.

Rosiek (2003) explained that emotional scaffolding involves teaching practices that help learners manage emotional experiences while participating in academic tasks. Emotional scaffolding is especially important in learning situations that involve fear, vulnerability, or uncertainty, such as second language communication activities. Supportive classroom environments may therefore reduce anxiety and encourage learners to participate more confidently.

In second language acquisition, emotional scaffolding can occur through collaborative learning, encouragement, positive feedback, and creative participation. Arts-based activities provide emotional scaffolds by creating enjoyable and interactive learning experiences that shift learners' attention away from fear and toward meaningful communication. Learners become more willing to experiment with language when they feel emotionally supported and less afraid of making mistakes.

2.5 Creative Expression and Reduction of Affective Barriers

Recent studies suggest that creative expression can reduce affective barriers and improve learners' emotional engagement during second language acquisition. Arts-based pedagogies create interactive and supportive classroom environments that encourage communication, collaboration, and self-expression.

Drama-based instruction has been widely recognized as an effective strategy for reducing language anxiety. Maley and Duff (2005) noted that drama encourages spontaneity, confidence, emotional intelligence, and social interaction among learners. Through role-play and performance activities, students can communicate more naturally while temporarily distancing themselves from personal insecurities.

Music has also been associated with emotional relaxation and improved language retention. Medina (2002) observed that music enhances learners' motivation, attention, and memory during language learning activities. Songs and rhythmic activities help learners practice pronunciation and vocabulary in enjoyable and less stressful ways.

Storytelling and poetry similarly encourage emotional engagement and communication practice. Through storytelling, learners' express ideas creatively and develop narrative competence without excessive fear of linguistic errors. Poetry recitation improves pronunciation, rhythm, and confidence in oral communication.

Gregersen and MacIntyre (2014) argued that emotionally supportive learning environments contribute significantly to learners' resilience, motivation, and communicative confidence. They emphasized that language teachers should not only reduce negative emotional experiences but also create positive and enjoyable learning opportunities for students.

Within the Nigerian context, emerging educational practices indicate growing interest in arts-based pedagogies. Some tertiary institutions have incorporated drama, music, storytelling, and collaborative creative projects into language instruction to improve learner participation and reduce classroom anxiety. However, empirical research specifically examining creative expression as an emotional scaffold in Nigerian tertiary institutions remains limited.

2.6 Empirical Review

Several empirical studies have examined the relationship between creative pedagogies and second language learning outcomes. Adebayo (2021) investigated drama-based instruction among French language learners in a Southwestern Nigerian university and found that students exposed to drama activities demonstrated improved oral communication skills and reduced classroom anxiety. The study concluded that drama encouraged active participation and enhanced learners' confidence.

Okafor and Ibrahim (2022) examined music-assisted language instruction among Arabic language students in Nigerian universities. Findings revealed that music-based activities improved learners' motivation, pronunciation practice, and willingness to communicate in the target language. Students also reported feeling more relaxed and emotionally engaged during lessons involving music.

Internationally, Galante and Thomson (2017) explored the impact of performing arts on second language learning among university students in Canada. Their findings showed that drama and performance-based activities reduced communication apprehension and increased learners' willingness to speak in the target language.

Similarly, Liu and Chu (2010) investigated digital storytelling in language education and found that creative multimedia activities enhanced learner motivation, confidence, and classroom participation. Students reported feeling less anxious because creative tasks allowed for self-expression and collaborative interaction.

Although these studies highlight the educational benefits of arts-based approaches, limited empirical attention has been given to creative expression specifically as an emotional scaffold for alleviating affective barriers in second language acquisition within Nigerian tertiary institutions. This study therefore seeks to fill this gap by examining how creative expression supports learners emotionally and contributes to more effective second language acquisition experiences.

2.7 Theoretical Framework

This study is anchored on Krashen's Affective Filter Hypothesis and Vygotsky's Sociocultural Theory.
Krashen's Affective Filter Hypothesis explains that emotional variables such as anxiety, self-confidence, and motivation influence learners' ability to acquire language effectively. According to the theory, learners with low anxiety and high confidence are more likely to internalize language

input successfully. Creative expression may therefore reduce learners' affective filters by creating enjoyable and emotionally supportive learning environments.

Vygotsky's Sociocultural Theory emphasizes the role of social interaction and collaborative learning in cognitive development. The theory suggests that learners acquire knowledge more effectively through supportive interactions within meaningful social contexts. Arts-based activities such as drama, storytelling, and collaborative creative projects provide opportunities for interaction, communication, and emotional support, thereby facilitating second language acquisition.
The integration of these theories provides a comprehensive framework for understanding how creative expression can function as an emotional scaffold for alleviating affective barriers in second language acquisition.

3. Research Methodology

3.1 Research Design

This study adopted a mixed-methods research approach using a descriptive survey design. The mixed-methods approach combined quantitative and qualitative methods in order to obtain comprehensive data on the role of creative expression as an emotional scaffold in alleviating affective barriers in second language acquisition. The descriptive survey design was considered appropriate because it enabled the researcher to gather data from students regarding their emotional experiences, participation in creative activities, and perceptions of arts-based instructional strategies in second language learning.

3.2 Population of the Study

The population of the study comprised undergraduate students enrolled in second language courses in selected Nigerian tertiary institutions. The institutions selected for the study were:

- University of Lagos, Lagos State.
- University of Ibadan, Oyo State.
- Federal College of Education, Abeokuta, Ogun State.

The target population included students studying French, Arabic, English language education, and other language-related courses where second language acquisition formed part of the academic curriculum.

3.3 Sample and Sampling Technique

A total sample of 240 undergraduate students was selected for the study. The sample consisted of students drawn from the three selected institutions as follows:

- University of Lagos – 80 students
- University of Ibadan – 80 students
- Federal College of Education, Abeokuta – 80 students.

The study employed purposive and stratified sampling techniques. Purposive sampling was used to select institutions with active language programmes and evidence of creative or interactive instructional practices. Stratified sampling was then used to ensure adequate representation of students across different language disciplines and academic levels.

3.4 Instrument for Data Collection

Data were collected using two research instruments:

- Arts-Based Emotional Scaffolding Questionnaire (ABESQ)
- Semi-Structured Interview Guide

The questionnaire was divided into five sections:

Section A: Demographic information of respondents.
Section B: Nature of affective barriers experienced in second language learning.
Section C: Forms of creative expression used in language classrooms.
Section D: Influence of creative expression on anxiety reduction and learner confidence.
Section E: Challenges affecting the integration of creative expression in second language acquisition

The questionnaire items were structured using a four-point Likert scale of: Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD)
The semi-structured interview guide was designed to obtain deeper insights into students' emotional experiences and perceptions of arts-based learning activities in second language classrooms.

3.5 Validity of the Instrument

The instruments were subjected to face and content validity by experts in language education, educational psychology, and arts education from Nigerian tertiary institutions. Their observations and recommendations were used to improve the clarity, relevance, and adequacy of the research instruments before final administration.

3.6 Reliability of the Instrument

A pilot study was conducted using 30 students from a tertiary institution outside the selected sample institutions. Data obtained from the pilot test were analyzed using Cronbach's Alpha reliability method. The reliability coefficient obtained for the questionnaire was 0.84, indicating that the instrument possessed high internal consistency and was suitable for the study.

3.7 Procedure for Data Collection

The researcher visited the selected institutions and obtained permission from relevant departmental authorities before administering the instruments. Copies of the questionnaire were distributed directly to respondents with the assistance of course lecturers and research assistants. The purpose of the study was clearly explained to participants, and confidentiality of responses was assured.

The interviews were conducted with selected students who voluntarily agreed to participate. Responses from the interviews were recorded and transcribed for analysis.

3.8 Method of Data Analysis

Quantitative data obtained from the questionnaire were analyzed using descriptive and inferential statistics. Descriptive statistics such as frequency counts, percentages, mean scores, and standard deviation were used to answer the research questions.

The hypotheses formulated for the study were tested using Pearson Product Moment Correlation and t-test statistical analyses at 0.05 level of significance.

Qualitative data obtained from interviews were analyzed thematically. Responses were organized into themes relating to emotional experiences, learner participation, confidence, anxiety reduction, and perceptions of creative expression in second language acquisition.

3.9 Ethical Considerations

Ethical principles were strictly observed throughout the study. Participation was voluntary, and respondents were informed about the objectives of the research before data collection. Participants' identities and responses were treated confidentially and used strictly for academic purposes. Respondents were also assured that they could withdraw from the study at any stage without any negative consequences.

4. Data Presentation and Analysis

This section presents the analysis of data collected from respondents on creative expression as an emotional scaffold for alleviating affective barriers in second language acquisition in tertiary institutions. A total of 240 questionnaires were administered to students across the University of Lagos, University of Ibadan, and Federal College of Education, Abeokuta. Out of these, 228 copies were properly completed and returned, representing a response rate of 95%.

The data were analyzed using descriptive statistics such as frequency counts, percentages, mean scores, and standard deviation. The hypotheses were tested using Pearson Product Moment Correlation and t-test statistics at 0.05 level of significance.

4.1 Demographic Information of Respondents

Table 1: Distribution of Respondents by Institution

Institution	Frequency	Percentage (%)
University of Lagos	76	33.3
University of Ibadan	74	32.5
Federal College of Education, Abeokuta	78	34.2
Total	228	100

The table shows that 33.3% of the respondents were from the University of Lagos, 32.5% were from the University of Ibadan, while 34.2% were from the Federal College of Education, Abeokuta. This indicates balanced representation across the selected institutions.

Research Question One: What are the nature and extent of affective barriers experienced by students during second language acquisition in tertiary institutions?

Table 2: Affective Barriers Experienced by Students

S/N	Items	SA	A	D	SD	Mean
1	I feel nervous when speaking a second language in class	102	86	24	16	3.20
2	I fear making mistakes during oral communication activities	118	74	20	16	3.29
3	I feel anxious when asked to respond publicly in a second language	95	89	28	16	3.15
4	Fear of negative evaluation affects my participation in language class	107	82	23	16	3.23
5	I avoid participating in classroom discussions because of anxiety	84	91	33	20	3.05

Grand Mean = 3.18

The findings reveal that students experience considerable affective barriers during second language acquisition. The grand mean score of 3.18 indicates that anxiety, fear of mistakes, communication apprehension, and fear of negative evaluation significantly affect learners' participation and confidence in language classrooms.

Research Question Two: What forms of creative expression are commonly used in second language learning?

Table 3: Forms of Creative Expression Used in Language Classrooms

S/N	Items	SA	A	D	SD	Mean
1	Drama and role-play activities are used during language lessons	110	82	20	16	3.25
2	Music and songs are incorporated into language learning activities	98	88	25	17	3.17
3	Storytelling activities are used to encourage communication	104	86	22	16	3.22
4	Poetry recitation is used to improve pronunciation and fluency	90	92	28	18	3.11
5	Digital creative presentations are used in language classes	81	84	41	22	2.98

Grand Mean = 3.15

The findings indicate that drama, role-play, storytelling, music, poetry, and digital creative presentations are commonly used forms of creative expression in second language classrooms. Drama and storytelling emerged as the most frequently utilized creative strategies among respondents.

Research Question Three: How does creative expression influence anxiety reduction and communication confidence among second language learners?

Table 4: Influence of Creative Expression on Anxiety Reduction

S/N	Items	SA	A	D	SD	Mean
1	Creative activities make me feel more relaxed during language lessons	115	80	20	13	3.30
2	Arts-based activities improve my confidence in speaking a second language	121	76	18	13	3.34
3	Drama and role-play reduce my fear of making mistakes	112	82	20	14	3.28
4	Creative expression encourages me to participate actively in class	117	79	19	13	3.31
5	Collaborative creative activities reduce classroom tension	109	84	22	13	3.21

Grand Mean = 3.29

The findings reveal that creative expression significantly contributes to reducing anxiety and improving communicative confidence among second language learners. Respondents agreed that arts-based activities create emotionally supportive learning environments that encourage participation and reduce fear.

Research Question Four: What are students' perceptions of arts-based instructional strategies in second language acquisition?

Table 5: Students' Perceptions of Arts-Based Strategies

S/N	Items	SA	A	D	SD	Mean
1	Arts-based activities make language learning enjoyable	126	72	18	12	3.37
2	Creative expression improves my motivation to learn languages	118	81	17	12	3.33
3	I prefer interactive creative activities to conventional teaching methods	120	78	19	11	3.35
4	Creative expression improves learner collaboration and interaction	114	82	19	13	3.30
5	Arts-based learning should be integrated into language curricula	128	70	18	12	3.38

Grand Mean = 3.35

The results indicate that students hold positive perceptions toward arts-based instructional strategies. Respondents agreed that creative expression enhances enjoyment, motivation, collaboration, and participation during second language acquisition.

Research Question Five: What challenges affect the integration of creative expression into second language teaching and learning?

Table 6: Challenges Affecting Integration of Creative Expression

S/N	Items	SA	A	D	SD	Mean
1	There are inadequate instructional resources for arts-based learning	109	83	22	14	3.26
2	Many lecturers lack training in creative instructional methods	115	78	21	14	3.29
3	Time constraints affect the use of creative activities in language classes	104	86	24	14	3.23
4	Some institutions prioritize conventional teaching approaches	111	80	23	14	3.26
5	Large class sizes limit effective creative participation	118	76	20	14	3.31

Grand Mean = 3.27

The findings show that inadequate instructional resources, insufficient lecturer training, time constraints, conventional pedagogical preferences, and large class sizes constitute major challenges affecting the integration of creative expression into second language teaching.

4.2 Test of Hypotheses

Hypothesis One

H_{01}: There is no significant relationship between creative expression and the reduction of affective barriers among second language learners in tertiary institutions.

Table 7: Pearson Correlation Analysis

Variables	N	r	p-value	Decision
Creative Expression and Reduction of Affective Barriers	228	0.72	0.000	Rejected

Since the p-value of 0.000 is less than the 0.05 level of significance, the null hypothesis was rejected. This indicates that there is a significant relationship between creative expression and the reduction of affective barriers among second language learners.

Hypothesis Two

H_{02}: Creative expression does not significantly influence students' confidence and participation in second language classrooms.

Table 8: t-test Analysis of Creative Expression and Learner Confidence

Variables	N	Mean	SD	t	p-value	Decision
Students exposed to arts-based strategies	114	3.41	0.62	5.84	0.000	Rejected

Variables	N	Mean	SD	t	p-value	Decision
Students exposed to conventional methods	114	2.76	0.71			

Since the p-value of 0.000 is less than 0.05, the null hypothesis was rejected. This indicates that creative expression significantly influences students' confidence and participation in second language classrooms.

Hypothesis Three

H_{03}: There is no significant difference in the anxiety levels of students exposed to arts-based instructional strategies and those taught through conventional teaching methods in second language acquisition.

Table 9: t-test Analysis of Anxiety Levels

Variables	N	Mean	SD	t	p-value	Decision
Students exposed to arts-based strategies	114	2.31	0.58	6.17	0.000	Rejected
Students exposed to conventional methods	114	3.12	0.67			

Since the p-value of 0.000 is less than the 0.05 level of significance, the null hypothesis was rejected. This indicates that students exposed to arts-based instructional strategies experienced significantly lower anxiety levels than students taught through conventional teaching methods.

5. Discussion of Findings

The study revealed that affective barriers remain a major challenge in second language acquisition among students in selected Nigerian tertiary institutions. Respondents reported experiencing nervousness, fear of making mistakes, communication apprehension, and fear of negative evaluation during language learning activities, particularly in oral communication exercises. These emotional difficulties negatively influenced learners' willingness to participate actively in classroom interaction and spontaneous communication tasks. The prevalence of anxiety observed among the respondents suggests that emotional factors continue to hinder effective language acquisition in tertiary institutions.

This outcome supports the position of Horwitz et al. (1986), who identified foreign language anxiety as a significant psychological factor affecting learners' communicative competence and classroom participation. The result also agrees with MacIntyre and Gardner (1994), who explained that anxiety interferes with cognitive processing and affects learners' ability to retain and produce language effectively. Krashen's (1982) Affective Filter Hypothesis further explains that learners with heightened anxiety and low confidence often struggle to internalize language input successfully. The present study therefore reinforces existing scholarship emphasizing the critical role of emotional conditions in second language acquisition.

Another important outcome of the study was the identification of various forms of creative expression used in second language classrooms. Drama, storytelling, music, poetry recitation, role-play, and digital creative presentations were commonly utilized instructional strategies among the sampled institutions. Drama and storytelling emerged as the most frequently used activities because they encouraged active participation and spontaneous communication among learners.

This finding corresponds with Eisner's (2002) argument that artistic experiences encourage imagination, interpretation, participation, and flexible thinking within educational environments. It also aligns with Greene's (1995) assertion that creative engagement enhances learners' emotional involvement and meaningful participation in learning processes. Maley and Duff (2005) similarly emphasized that drama-based activities promote confidence, spontaneity, and social interaction among language learners. The increasing use of creative instructional activities observed in the selected institutions indicates a gradual shift toward learner-centered pedagogical practices within Nigerian tertiary education.

The study further demonstrated that creative expression contributes significantly to reducing anxiety and improving communication confidence among second language learners. Respondents indicated that arts-based activities made language learning more relaxed, enjoyable, and interactive. Students also reported feeling more confident during communication tasks when involved in drama, music, storytelling, and collaborative creative activities. These activities reduced fear of criticism and encouraged freer participation during classroom interaction.

This result agrees with Gregersen and MacIntyre (2014), who argued that emotionally supportive and engaging learning environments help learners develop resilience, confidence, and communicative competence. It also supports Medina's (2002) position that music and creative engagement

improve learners' motivation, emotional involvement, and attention during language learning. Similarly, Adebayo (2021) observed that drama-based instruction reduced classroom anxiety and enhanced oral communication among French language learners in Southwestern Nigeria. In the same vein, Okafor and Ibrahim (2022) reported that music-assisted language instruction improved learner motivation and reduced communication apprehension among Arabic language students in Nigerian universities.

While previous studies largely examined individual creative strategies separately, the present study approached creative expression more broadly as an emotional scaffold encompassing multiple artistic and participatory activities. This broader perspective provides additional insight into how different forms of creative engagement collectively contribute to reducing affective barriers in second language acquisition.

Students' perceptions toward arts-based instructional strategies were generally positive. Respondents expressed preference for interactive and creative classroom activities over conventional teacher-centered instructional methods. Many students believed that creative expression enhanced motivation, collaboration, participation, enjoyment, and confidence during language learning. The positive attitudes expressed by learners suggest that arts-based pedagogies create emotionally safe and supportive environments that encourage meaningful communication.

This outcome supports Vygotsky's (1978) sociocultural perspective, which emphasizes the importance of supportive interaction and collaborative learning in cognitive development. It also corresponds with Rosiek's (2003) concept of emotional scaffolding, which explains that emotionally supportive teaching practices encourage learners to engage confidently in academic activities. Mercer and Dörnyei (2020) similarly emphasized that positive emotional experiences within classrooms contribute significantly to learner motivation and well-being. The present study therefore demonstrates that emotionally supportive and creative learning environments can improve learners' attitudes toward second language acquisition.

Despite the positive contributions of creative expression, several challenges affecting its integration into second language teaching were identified. Respondents highlighted inadequate instructional resources, insufficient lecturer training, time constraints, large class sizes, and institutional preference for conventional teaching methods as major obstacles to the implementation of arts-based pedagogies. These challenges indicate that although creative instructional approaches possess substantial educational value, institutional and structural limitations continue to hinder their effective application in tertiary institutions.

This observation aligns with Orafi and Borg (2009), who noted that innovative language teaching practices are frequently constrained by institutional policies, rigid curriculum structures, and inadequate resources. Nunan (2003) also observed that large class sizes and examination-oriented educational systems often limit opportunities for interactive and learner-centered instruction. The present study confirms that similar constraints continue to affect second language pedagogy within Nigerian tertiary institutions.

The hypotheses tested also provided important insights into the relationship between creative expression and second language acquisition. The rejection of the first hypothesis established a significant relationship between creative expression and the reduction of affective barriers among second language learners. This outcome suggests that arts-based activities play an important role in lowering anxiety, reducing fear, and improving learners' emotional comfort during language learning activities. Such a result further validates Krashen's (1982) position that emotionally supportive learning environments facilitate language acquisition by lowering learners' affective filters.

The second hypothesis revealed that creative expression significantly influences students' confidence and participation in second language classrooms. Students exposed to arts-based instructional strategies demonstrated higher levels of communicative confidence and classroom participation than those taught through conventional methods. This result supports Maley and Duff's (2005) view that creative activities enhance spontaneity, self-expression, and social interaction among learners.

Similarly, the rejection of the third hypothesis showed that students exposed to arts-based instructional strategies experienced lower anxiety levels than those taught through traditional teaching approaches. This outcome corresponds with studies conducted by Gregersen and MacIntyre (2014), Galante and Thomson (2017), and Adebayo (2021), all of which reported that creative and performance-based pedagogies contribute significantly to reducing language anxiety and improving learner participation.

Overall, the study establishes that creative expression functions effectively as an emotional scaffold capable of alleviating affective barriers in second language acquisition. Arts-based pedagogies provide emotionally supportive learning

environments that encourage confidence, collaboration, participation, and meaningful communication among learners. The study therefore reinforces the importance of integrating creative and emotionally responsive teaching strategies into second language instruction within tertiary institutions.

6. Conclusion

This study examined creative expression as an emotional scaffold for alleviating affective barriers in second language acquisition among students in selected Nigerian tertiary institutions. It established that emotional factors such as anxiety, fear of negative evaluation, communication apprehension, and low self-confidence significantly affect learners' participation and performance in second language classrooms. The findings revealed that many students experience emotional tension during oral communication activities, thereby limiting their willingness to interact freely in the target language.

The study further demonstrated that creative expression through drama, storytelling, music, poetry, role-play, and digital creative activities contributes significantly to reducing learners' anxiety and improving communication confidence. Arts-based instructional strategies were found to create emotionally supportive and interactive learning environments that encourage participation, collaboration, self-expression, and learner engagement. Students exposed to creative pedagogical practices reported increased motivation, improved confidence, enhanced classroom interaction, and greater willingness to communicate in second language learning contexts. The findings also revealed that learners possess positive perceptions toward arts-based instructional approaches and prefer interactive creative activities to conventional teacher-centered teaching methods. However, despite the educational potential of creative expression, several challenges hinder its effective integration into second language pedagogy in Nigerian tertiary institutions. These challenges include inadequate instructional resources, insufficient lecturer training, large class sizes, rigid curriculum structures, and institutional preference for traditional instructional approaches.

Overall, the study concludes that creative expression functions effectively as an emotional scaffold capable of alleviating affective barriers in second language acquisition. By reducing anxiety and promoting emotionally supportive learning experiences, arts-based pedagogies contribute positively to learners' communicative competence, confidence, and active participation in language classrooms. The study therefore highlights the importance of integrating creative and emotionally responsive instructional approaches into second language teaching and learning in tertiary institutions.

7. Recommendations

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

- Language educators in tertiary institutions should integrate arts-based instructional strategies such as drama, storytelling, music, poetry, role-play, and digital creative activities into second language teaching in order to reduce learners' anxiety and enhance classroom participation.
- Tertiary institutions should organize regular workshops, seminars, and professional development programmes to train language lecturers on the effective use of creative and emotionally responsive pedagogical approaches in second language acquisition.
- Curriculum developers should incorporate creative expression and arts-based learning activities into second language curricula to promote learner-centered and interactive teaching practices.
- Educational administrators should provide adequate instructional resources, creative learning spaces, and technological facilities that support arts-integrated language teaching and learning.
- Language lecturers should create emotionally supportive classroom environments where mistakes are viewed as part of the learning process rather than grounds for criticism or embarrassment.
- Institutional policies should encourage interdisciplinary collaboration between departments of languages, arts education, theatre arts, music, and educational technology in order to strengthen creative pedagogical practices.
- Further empirical studies should be conducted in other educational contexts and geographical regions to examine the long-term effects of creative expression on language proficiency, emotional well-being, and communicative competence among learners.

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Access to Fine Arts Education and its Influence on Cultural Capital and Academic Engagement in Marginalized Communities of South-west Nigeria

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Abstract. Nigeria's educational system is struggling with uneven distribution of educational resources, infrastructure, and structured extra-curricular opportunities across various field of study which is subjective across distinct regions and social class of her inhabitants. These have reflected in students' academic mind-set, experience, and attitude towards learning. Contextually, the education in south-western states such as Lagos and Ogun political zones demonstrate a systemic bias towards science-based subjects over art, commerce and other intellectual creative agencies. The priorities on Science, Technology, Engineering, and Mathematics (STEM) subjects over art and commerce is what create a "curricular hierarchy" where students living and schooling in underserved communities are mentally steered away from creative disciplines that are capable of yielding positives outcomes in their lives. The study investigates two (n=2) public senior secondary schools each, found in marginalized communities of Lagos and Ogun states across Ojo and Agbara Local Government Areas (LGA). Data collection was conducted using qualitative "dyadic" interviews involving paired senior secondary school fine art teachers and students i.e. one (n=1) teacher to one (n=1) student was selected as pairs for the interview, through purposive sampling of the teacher's academic qualification and the student's academic track record in the subject. Thematic codes were generated and analysed to identify recurring patterns between the systemic pressures and aspiration towards incorporating structured Culturally Responsive Pedagogy (CRP) into the traditional methods of teaching fine arts. The findings indicate that culturally sustaining pedagogy can improve student engagement. Hence, the study concludes that to redress these disparities, Nigerian Educational and Research Development Council (NERDC) should consider restructuring the curriculum contents by reallocating Eurocentric art history towards our indigenous knowledge. Furthermore, it is imperative that the ministry of education ensures to formalize the policy benchmarks mandating, dedicated to funding of public-school art studios in order to eliminate gaps in resources, and also ensure that that the system integrates intrinsic Art-preneurial Economics (AP-EC) to provide youths with profitable vocational skills. Lastly, deploy mandatory Teacher Professional Development (TPD) that focuses on Culturally Sustaining Pedagogy (CSP).

Keywords: Fine Arts Education, Culturally Sustaining Pedagogy, Cultural Capital, Marginalized Communities, Educational Inequality, South-west Nigeria.

1. Introduction

1.1 Background of the Study

Education remains a fundamental instrument for social and economic development, yet several significant disproportions persist in the promise of Nigeria's 6-3-3-4 educational system, as access to quality education across diverse geographic, socio-economic, and cultural zones remains uneven. Across the world, it is obvious that inequalities in the provisions for education shapes students' attitudes and experiences towards learning, which is a major reflector in their academic outcomes — this is particularly common in developing countries where resources are constrained and highly pronounced.

Nigeria's educational system is an obvious example of a country struggling with these disparities due to the huge uneven distribution of educational resources, infrastructure, and structured extra-curricular opportunities that lies between urban and marginalized communities. These has reflected in

students living in underserved areas of the country, as they often experience limited access to well-structured or rounded educational programs, which in turn affects their academic engagement and overall self-development. This issue is particularly evident within the industrial corridors of South-West Nigeria, specifically in Lagos and Ogun States, where educational systems frequently prioritize science-based disciplines over arts-related subjects. This is likely driven by the region's status as a manufacturing, mega and technological hub, which causes public secondary school curricula to frequently prioritize STEM subjects (Olaniyan, 2022). These priorities create a "curricular hierarchy" where students in marginalised community are discouraged from pursuing creative disciplines that are capable of producing positive educational and socio-economic outcomes in their lives (UNESCO, 2022; Eze *et al.,* 2023).

Moreover, these inequalities are responsible for reinforcing existing social stratifications, thereby hindering the ability of Nigeria's educational system to promote an inclusive and equitable learning environment. In this vein, fine art education which is a critical branch of academics is often undervalued in terms of holistic teaching and learning. Fine arts, which include visual arts, drawing, and creative expression — play a crucial role in the promotion of creativity, critical thinking, and expression among students. Several scholars have argued that exposure to Fine Arts Education helps students develop social interaction skills and broader educational competencies (Eisner, 2002; Gardner, 2011). (Elliot Eisner, 2002; Howard Gardner, 2011). However, (UNESCO, 2022) indicate that in many public secondary schools in "marginalized" communities in southwest Nigeria, the access to structured fine arts instruction remains limited due to inadequate funding, shortage of qualified teachers, and policy neglect. Hence, this restricted access reduces opportunities for students to develop creative competencies.

The relevance of fine art education can be further understood through a term known as "cultural capital", a concept that was developed by Pierre Bourdieu (1986), which explains how non-economic resources such as knowledge, skills, cultural awareness, and educational exposure influences social mobility and academic success among people. Cultural capital exists in various forms, which include embodied dispositions (e.g., communication skills and aesthetic appreciation), objectified forms (e.g., access to cultural materials), and institutionalized forms (e.g., educational qualifications). Contextually, in education; adequate access to fine arts instruction can serve as a critical avenue through which students acquire these forms of cultural capital. However, the engagement of students with artistic practices not only enhances their creative competencies but also strengthens their confidence, participation, and interaction within formal educational settings.

1.2 Problem Statement

Despite the existing concerns and growing body of literature on art education merged with student development, it is for a fact that existing studies primarily focus on the cognitive and creative benefits of arts education. Most of these studies are conducted within structured educational systems in developed countries. Conversely, limited attention has been given to how access to art education programs is capable of shaping students' cultural identity, academic engagement, and social development in marginalized contexts or settings, most especially in Sub-Saharan Africa (UNESCO, 2022). In Nigeria, while some general studies on education have examined academic inequality and distribution of resources, there remains a significant gap in empirical research that specifically links fine arts education to sociological outcomes in terms of human resources, management, formation of cultural development, students' motivation and engagement in unexposed communities, most especially south-western parts of Nigeria (Adeyemi, 2024).

However, while quantitative data can statistically provide the mapping of resource deficit and the prioritization of STEM over fine arts whilst other creative and intuitive activities in southwest Nigerian schools and institutions, it is for a fact that numbers alone cannot capture the overall internal shifts in a student's identity (Cameron *et al*, 2024). Ideally, a qualitative approach is required to breakdown the critical factors influencing the shift towards quality fine art education, and likewise understanding how students found in these marginalised communities perceive their own creative agency within a curriculum that often renders their talents invisible. The essence, of this approach moves beyond mere 'counting' to 'meaning making' i.e., exploring the lived experiences of educators and learners as they navigate the 6-3-3-4 system hierarchies. Therefore, there is a need for context-specific empirical research that examines the relationship between access to Fine Arts Education, cultural capital, and academic engagement among students in marginalized communities in South-West Nigeria.

1.3 Study Aims and Objectives

The study aims to empirically assess how Fine Arts Education contributes to students' creative development, cultural awareness, and academic

engagement in marginalized communities of South-west, Nigeria. The specific objectives are to:

- Examine access to Fine Arts Education in marginalized communities.
- Assess the influence of Fine Arts Education on students' cultural capital.
- Investigate the relationship between Fine Arts Education and academic engagement.
- Explore challenges affecting access to Fine Arts Education and suggest solution.

2. Literature Review

2.1 Connected Arts Education, Cultural Development, and Student Engagement

Peppler *et al.* (2022) introduced the concept of 'connected arts learning'— thus, it this simply means that fine art education could be extended beyond mere technical skill acquisition to encompass overall, and civic dimensions of learning. However, their study schematically demonstrates how learning environments and stakeholders' can merge students' personal interests with academic contents and future career pathways. Figure 1 illustrates the Connected Learning Model proposed by Ito et al. (2020)

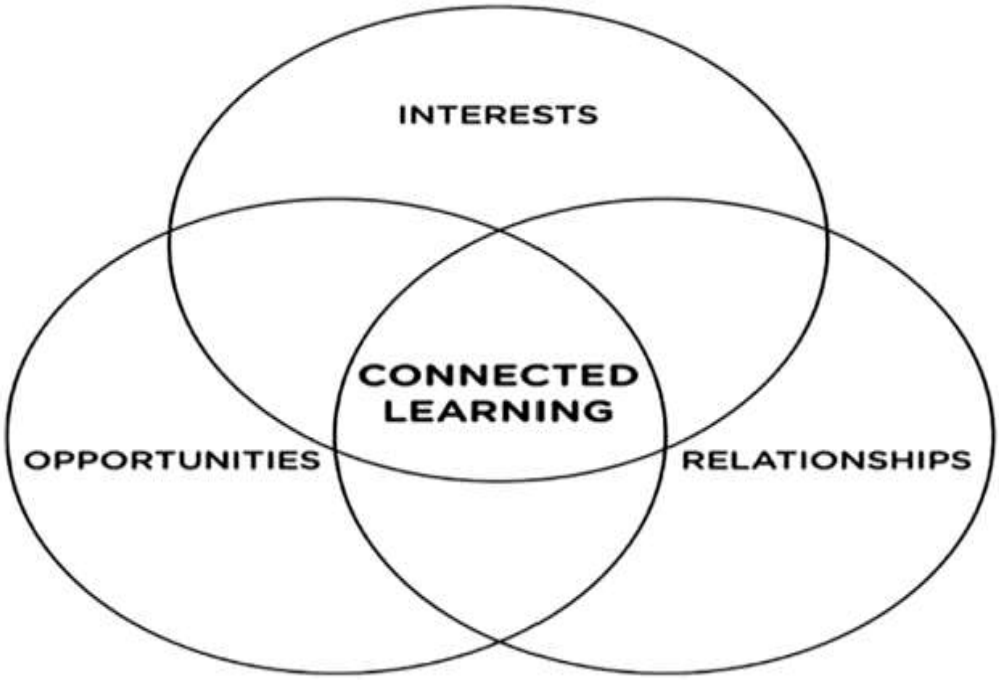


Figure 1 — Model of Connected Learning
Source: *Figure republished from Ito, Arum, et al. (2020), licensed under a Creative Commons Attribution Unported 3.0 License (CC BY 3.0).*

The model demonstrates the interaction among students' interests, academic experiences, and community participation. However, a connected learning approach can be culturally responsive as it emphasizes the need to support students and youths from non-dominant backgrounds by linking their self-interests to academic, civic, and career outcomes within an integrated system that connects home, school, culture, and community (see Figure 2). Rather than adopting uniform, one-size-fits-all approaches, this perspective advocates for learning environments that has the designed intention to reflect students' specific interests and identities, and experiences, while promoting meaningful community engagement. In this perspective, it is imperative that culturally responsive programs move away from Eurocentric or colonial assumptions and instead anti-racist pedagogies or approaches that promote positive ethnic identity and critical consciousness among learners (Cammarota, 2007; Hipolito-Delgado & Zion, 2015; Terriquez, 2015).

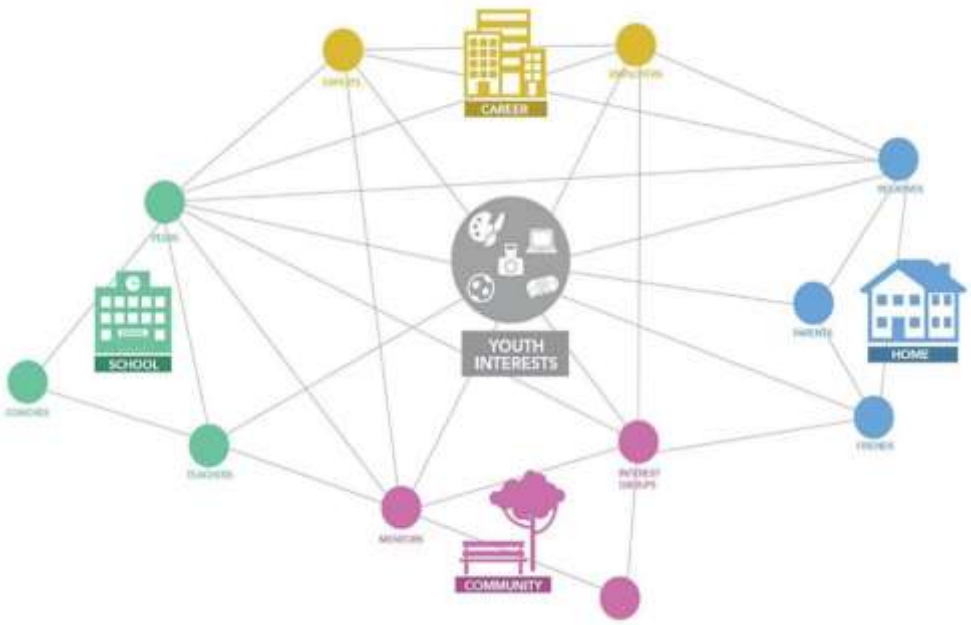


Figure 2 — Youth Interests Support Connections Across Settings
Source. Figure adapted from Ito, Arum, et al. (2020), licensed under a Creative Commons Attribution Unported 3.0 License (CC BY 3.0). Image credit: Nat Soti.

Moreover, more recent studies made emphasis on the cultural dimensions of art education. Zufriady *et al.* (2024) conducted a review on the role art education is capable of playing to sustain cultural values and identity across diverse ethnic groups and subgroups — the study highlighted that it can be cultivated through the transmission of indigenous knowledge and cultural practices into art pedagogy and policy. However, the review also reveals the methodological constraints within existing literatures, hereby emphasizing a predominance of qualitative approaches and a lack of thorough quantitative evidence that connects art education to measurable standardized or accepted outcomes such as academic performance or engagement.

2.2 Art Integration and pedagogical Transformation

The integration of art involves using artistic method as part of teaching-learning process to impact innovation and creative mind-set out of students both inside and outside the classroom. This is considered as a cognitive instructional process or approach designed to contribute to the creation of socially and emotionally supportive learning spaces that encourage student willingness, participation and interaction with academic activities (Anderson *et al*., 2020; Pitts *et al*., 2018). However, when creativity is placed at the centre of instruction i.e. teaching and learning, it explicitly allows art function as an effective pedagogical tool for enhancing student learning outcomes (Anderson, 2018). Through art integration, students are able to engage with academic content from multiple perspectives simultaneously, thereby improving not only their comprehension but their retention of subjects beyond the arts, including sciences (Hardiman *et al*., 2014). In addition, art-integrated instructional strategies have been shown to support learners with limited language proficiency and for students will lower academic skills by providing them with alternative pathways for demonstrating their self-understanding and mastery of academic concepts.

According to Sarah *et al*. (2024) — higher education largely prioritizes theoretical-base over vocational outcomes for students, which makes the place of art practices within learning environment more complicated, because courses under the disciplines of creative, performative, and human Kinetics requires more of action i.e. practice over theoretical learning. However, this continually raises questioning on the marginalisation of creative arts practice in higher education in developed countries such as Australia, hereby pressuring institutions into delivering superficial learning experiences that are disconnected from the relationship between place, people, histories, and purpose which are necessary for sustainable, effective, and impactful creative arts educators, technical workers for the training in ethical art training and practice (Meyrick, 2018; Wilson, 2018). Therefore, art stakeholders and practitioners pursue professional art practice in the university for numerous reasons, not all of which are about aiming at a peak academic career but impactful community, engaged in creative practice that yield transformational and experiential moment for students or random individuals interested in art practice regardless of their intended career.

2.3 Inequality in Access to Quality Art Education

Presently in marginalised environments, it is for a fact that the issues of social inequality in access to quality education persist due to lack of fundamental resources, this is most especially concerned in art education and other disciplines that practice creativity alongside cognitive extracurricular activities. As Burkhard *et al.* (2024) reveals, one of the major significant factor that influences the access to quality art education are parents with the sovereign of cultural or economical capital, that is to say — students with more advantaged backgrounds have greater opportunities to participate in creative, performative, and cultural activities such as artistic, musical, and sports activities. Nevertheless, this opinion is a wide-range reflection of Pierre Bourdieu's (1986) theory, who contends that as time evolves, contemporary educational system is designed to constantly reproduce existing differences or inequalities in the society at large, by endowing cultural knowledge in different forms of social class which often favours the dominant privileged class or set of people. Contextually, it simply explains that within the discipline of art education, this dynamic is particularly visible, because other than parent encouragement or self-motivation — to effectively participate in artistic activities in marginalised or underdeveloped learning environment, it frequently and largely depends on access to more of personal financial resources than institutional infrastructure. Consequently, students from marginalized communities often experience restricted access to arts-based opportunities, limiting their ability to develop forms of cultural capital that may positively influence educational engagement and achievement.

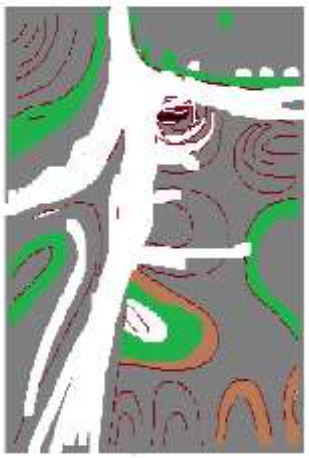
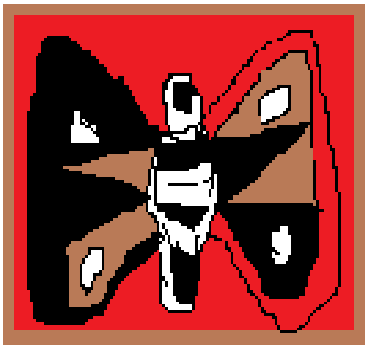
2.4 Culturally Sustaining Pedagogy (CSP) through Yoruba Iconography

Cameron *et al.* (2024) made emphases on cultural sustainability and culturally responsive teaching methods that combines a teacher's competency in indigenous contexts with contemporary classroom teaching strategies that aid students to connect with their background both culturally and linguistically to attain positive academic outcomes. Hansen *et al.,* (2018) note that the implementation of this teaching method relies on two key foundation which are: (i) systematic lesson planning and (ii) relevant cultural information that can fit into modern day pedagogy. As there still exist a solid connection between culture and learning, teachers should be tasked with the role to maximize students' knowledge and willingness to learn their culture (Ford *et al,* 2014). However, culturally sustaining pedagogy (CSP) is built upon the work of Ladson-Billings' — noting that "culturally relevant pedagogy (CRP) should focus on linguistic, literacy, myths, spirituality, and cultural pluralism as part of the democratic project of schooling" (Paris, 2012)

Thus, following the aspirations for culturally sustaining praxis as seen in Cameron *et al.* (2024) study — art education in southwest Nigeria should function as a site for reinterpreting iconography in formal pedagogical standard. According to Kafaru *et al.* (2025), the integration of indigenous symbols such as *Egungun* costumes, *Ifa* divination patterns, and Yoruba motifs into contemporary teaching methods allows students to engage in 'practice-led dialogues' between tradition and modernism in fine arts. This approach ensures that Nigeria's pedagogical curriculum does not become a tool for cultural extinction but rather a platform for sustaining indigenous visual languages.

Table 1: Abiodun Kafaru's Interpretation of Some Yoruba Forms

Indigenous Coastal Yoruba Social Life & Cultural Space	Artistic Signs, Symbols, Patterns &Motifs	Origin, Source & Context	Meaning / Use	Artistic Iconographic Depiction
Eyo Adamu Head 	Spirituality, Power, leadership, colour, status in Eyo masquerade	*Eyo-Adamu Orisha* Highest-ranking Eyo masquerade in Lagos State. *Eyo* socio-cultural masquerade performance	Ritual, Social, private & Public contexts; Represents strength & spirituality	

Orita Meta Six Junction	Lines, shapes, mysteries of life; indicates the unknown to the non-initiates	Myth, history, ritual and indicates sacrifice	The image is a symbol of spiritual cleansing and mysteries of life. This is an illustration of where six major roads cross each other. The Yoruba believe that spirit dwells in and exists at this interjection.	
Igba Oye Chieftaincy pot 	Colour, form; religious cyclical continuity of family tradition	Ritual pot expresses sociocultural mysteries of lifecycle	*Igba Oye* Symbol of rituals and ordination among initiates and Chieftaincy within family and the cult initiations.	
Labalaba Butterfly 	Motif; colour shape; and space	*Adire*; fabric design; social functions and practices	History and nature. Depicts local insects and it allowes a simple geometric	

Aso Agbara Charmed Wear- Yoruba fabric worn by the hunters and Akogun	Shape, pattern and lines	History spiritual power and strength among the worshipers of *Ogun*, *Akan* and ritual power.	*Aso Agbara* Represents or reflects the power of hunters and *Akogun*	

Source: Kafaru et al. (2025). *Reinterpreting Yoruba Iconography through Contemporary Painting: Practice Led Dialogues between Tradition and Modernism in Arts*. *Pp.113.* Journal of Educational Review Vol 16. No 2.

However, as Kafaru *et al.* (2025) postulates — the neglect of cultural forms in contemporary African arts studies has been argued to be as a result of the preoccupation by African art scholars, writers, critics, and historians with traditional art forms, or the so-called "indigenous'' art and "authenticity'' of African culture in the sight of the world. This neglect has also been the product of the widespread misconception that contemporary African art practices is a distorted or mere copy of western culture, and therefore lacks authenticity, originality, and depth. Furthermore, the study suggests that "the integration of these cultural concepts in modern day pedagogy serves not merely as an aesthetic form of venture but as an essential medium that must be integrated into the basic art pedagogy for cultural preservation, critical thinking, spiritual and emotional expressions of Yoruba land".

2.5 The Imperative for Teacher Professional Development in Culturally Sustaining Arts

To integrate these contemporary teaching methodologies in marginalised communities, most especially in southwest Nigeria — it requires more than just updated textbooks; however, it demands a foundational restructuring in teachers' professional development. As highlighted in Cameron *et al.* (2024), there is critical need for educators to engage in training that moves beyond basic vocational practices in fine arts. Ideally, the training should build a stronger area of inquiry, curriculum, and instructional practices that incorporate both art integration and culturally responsive and sustainable pedagogical practices (Dana, 2022). Similarly, the idea of proposing reflective professional development should have the prospect and potential to shift teachers' mind-set, beliefs, and ideas towards "anti-racism" in order to sustain culturally responsive teaching. In addition, the integration of art as a collaborative academic engagement process can serve as pedagogical conduct that aims to use culture and racial identity within the arts as an authentic connection to academic contents (Gay, 2010).

Furthermore, educators such as art teachers in marginalised communities specifically lack high-quality resources in arts integration that meet the standard of urban art teachers — equally the Nigeria educational curriculum designed for fine art education lacks resources that explicitly link with learning about positive cultural and racial identity. In that sense, high-quality and meaning training, and proper restructuring of the curriculum can help teachers scaffold curricula in this area of pedagogy (Pauly *et al.,* 2019).

Table 2: Four Competencies for culturally responsive educators used in analyses of teacher syllabus and lesson plan document

Competency	Indicators
Recognize and redress bias in the system	Course contents provides for a balance study of culture
	Classroom learning activities promotes appreciation for diverse cultures
	Curriculum includes information and opportunities to explore the past/present experiences and contributions of people from varied cultural backgrounds
Draw on students' culture to shape curriculum and instruction	Issues and perspectives of minor groups are included
	Curriculum engages with narratives other than the dominant narrative
	Biased information and/or stereotypes, if present, are addressed
Promote respect for students' differences	Students are given space to express what is important to them (i.e. what they love and where they come from)
	An attempt has been made to 'localize' the curriculum
	The work & artists who are centered is relevant to students' experience

Bring real-world issues into the classroom	Teacher provides opportunities for students to share their perspectives and listen to others with respect and open mindedness
	Teachers invite students to share their perspectives and questions about real-world issues that matter to them
	Teachers integrate opportunities to discuss and think about real-world issues into classroom content

Source: Cameron et al. (2024*). Mirrors and windows:" a case study of educators' culturally responsive teaching aspirations and syllabi transformation in the arts.* Teaching and Teacher Education 148 (2024) 104714

Table 2 as seen in Cameron *et al.* (2024) study is an analyses study of contemporary teachers' first efforts to decolonize an existing vague syllabus and lesson plan to develop competent culturally inclined and responsive educators. However, their research was made to understand the concept and equally factor out framework regarding the development culturally sustaining pedagogy whereby citing Muñiz (2019) who stated the following competencies: (i) to reflect on one's cultural lens; (ii) to recognize and redress bias in the system; (iii) to draw on students' culture to shape curriculum and instruction; (iv) to bring real-world issues into the classroom (v); to model high expectations for all students; (vi) to promote respect for student differences (vii); to collaborate with families and local the local or marginalised communities; and (viii) to communicate in linguistically and culturally responsive ways. Furthermore, Cameron *et al.,* (2024) stated that this framework can progressively and analytically frame to learn how teacher competency can emerge and evolve in the task of revising instructional and curricular materials.

3. Methodology

3.1 Research Design

This study adopted an exploratory qualitative case study design informed by the culturally responsive outline of Cameron et al. (2024) and the indigenous iconographic perspectives of Kafaru et al. (2025).

3.2 Population and Site Selection

The study investigates two (n=2) public senior secondary schools each, found in marginalized communities of Lagos and Ogun states across Ojo and Agbara Local Government Areas (LGA). Data collection was conducted using qualitative "dyadic" interviews involving paired senior secondary school fine art teachers and students i.e. one (n=1) teacher to one (n=1) student was selected as pairs for the interview, through purposive sampling of the teacher's academic qualification and the student's academic track record in the subject. The selections are as follows:

For Educators: Purposive sampling was used to select secondary school teachers who navigate the tensions of the 6-3-3-4 system.

For Students: Learners were selected based on their track record engagement with visual arts as a secondary or "marginal" subject and academic performance in the subject.

Dyadic Interview: Dyadic interview is a type of qualitative interview whereby two participants are interviewed at the same time (Houssart & Evens, 2011; Morgan *et al.,* 2013; Wilson *et* al., 2016, Cameron *et al.,* 2024). It is commonly used in research work if the case study is concerned with the relationship or interaction between two people. The purpose of dyadic interview is to: observe how two people interact, compare their opinions or experiences, understand shared experiences and differences, and it generates deeper discussion than an individual interview (Kvalsvik & Øgaard, 2021).

Interview Protocol: In the progress of this research, we were able to extract the Fine arts teaching outlines of senior secondary education, and linked them with the concepts of culturally responsive pedagogy as seen in section 3.3. The interview focused on areas which include:

- Access to Fine Arts resources
- Experiences with Fine Arts learning
- STEM prioritization
- Cultural identity
- Student engagement
- Academic experiences

Participants were asked to describe their cultural heritage, their reason for choosing to become a Fine Arts teacher, their interest in teaching Fine Arts education as a student, and their views of social justice as Fine Arts is concerned with other fields of study such as science and technology. The reason we specifically used Cameron *et al.* (2024) mode of specification in interacting with the participants was to try and promote a sense of positive cultural identity among students in the classroom. In addition, the study also examined teachers' motivation toward promoting creative and vocational learning.

3.3 Data Collection and Analysis Procedure

Following the completion of the dyadic interviews we conducted with the teachers and students, all verbal investigations and responses were recorded on audio recordings which was transcribed. The

transcripts were thoroughly read repeatedly to ensure we extract deep familiarity with participants' responses and to support accurate interpretation of meaning. The data analysis process initially followed a structured four-stage coding procedure (see Fig 3), to ensure that there is clarity while linking interview questions with participant responses ensuring a clear linkage between interview questions, participant responses in which we eventually classified and define them into associative categories and we analyzed our observations accordingly with their research application.

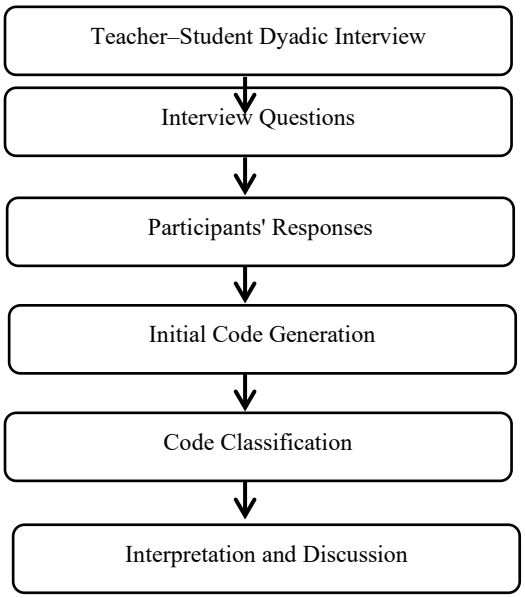


Figure 3: Flow Chart of Data Analyses Procedure
Figure 3 illustrates the stages involved in the qualitative data analysis process, beginning with teacher–student dyadic interviews and ending with interpretation and discussion of findings

Table 3a: Teacher Interview Outline

Question Focus	**Sample Response**	**Initial Code Formulation**
Availability of Fine Arts resources	There are insufficient art materials.	Fine Arts Education – Resource Availability
Challenges in teaching Fine Arts	We lack studios and equipment.	Resource Deficiency in Education
Administrative support	School management focuses more on science subjects.	Science, Technology, Engineering and Mathematics Prioritization
Student response to Fine Arts	Students show interest during practical activities.	Student Interest in Fine Arts
Cultural integration	Yoruba symbols improve understanding.	Cultural Identity Integration
Academic engagement	Students become more active during art lessons.	Student Academic Engagement in Fine Arts
Recommendations	More Fine Arts facilities are required.	Fine Arts Education Improvement Strategies

Table 3b: Student Interview Outline

Question Focus	**Sample Response**	**Initial Code Formulation**
Access to materials	Art materials are difficult to obtain.	Material Accessibility in Fine Arts Education
Learning experience	Practical sessions are enjoyable.	Practical Learning Experience in Fine Arts
Teaching methods	Teachers use demonstrations.	Teaching Methods in Fine Arts Education
Cultural understanding	Local cultural examples help me learn.	Cultural Application in Learning
School participation	I like to attend classes more.	Students Engagement with Fine Arts Education
Confidence level	I feel more confident when presenting work.	Self-Confidence Development in Students
Recommendations	We need more art activities.	Fine Arts Education Suggestions for Improvement in the curriculum

Table 3a and 3b shows how the codes were initially developed directly from participants' responses, with each code linked to a specific interview question. This ensured that coding remained grounded in the original data and maintained alignment with the research instrument.

Table 3c: Classification of the Codes

Theme	Categories
Systemic Challenges in Fine Arts Education	Educational Resource Access
Cultural Capital Development	Cultural Identity and Awareness
Academic Engagement Through Fine Arts	Student Academic Engagement
Transformative Role of Fine Arts Education	Student Development Outcomes
Strategies for Improving Fine Arts Education	Improvement Strategies

Table 3c shows how the categories were further synthesized into overarching themes that represent the central meanings derived from the dataset. However, Table 4-7 were classified into similar categorized accordingly to the pedagogical approach to redress the gaps of access to quality education in Fine Arts Education with their research application. The essence is to relate participants' narratives to relevant literature that explains how access to Fine Arts Education influences cultural capital development and academic engagement among students, particularly in marginalized communities of South-West Nigeria.

Table 4: Cluster I — The Systemic Baseline

S/N	Abbreviated Code	Code	Research Application / Analysis
1	FAE	Fine Arts Education	Evaluating the delivery of NERDC visual arts in marginalized schools.
2	STEM-P	STEM Prioritization	Analysing the systemic bias that favours Science over the Humanities.
3	EDU-IQ	Educational Inequality	Identifying the qualitative gap between urban and marginalized communities.
4	RES-D	Resource Deficit	Exploring deficiencies in art facilities and instructional resources.
5	CUR-B	Curriculum Bias	Measuring the 60% Western-centric dominance in the current syllabus.

Table 4 presents thematic codes developed during data analysis; this empirical data establishes a severe Resource Deficit (RES-D) across the sampled schools. The analysis suggests that the 6-3-3-4 Science Bias I.e. Stem Prioritization STEM-P acts as a gatekeeper, effectively locking Fine Art Education (FAE) out of the primary academic budget. Participants noted that the Curriculum Bias (CUR-B) forces them to prioritize "Global Art" that feels foreign to the students' lived experience. This creates a disconnection whereby Fine Arts Education (FAE) is viewed as a "soft elective," fuelling Educational Inequality (EDU-IQ).

Table 5: Cluster II — The Cultural Mirror (Identity & Heritage)

S/N	Abbreviation	Code	Research Application / Analysis
1	CUL-ID	Cultural Identity	How students see their Yoruba/coastal heritage reflected in the syllabus.
2	IND-K	Indigenous Knowledge	Integrating traditional wisdom and craft techniques into formal lessons.
3	Y-ICON	Yoruba Iconography	Using *Adire*, *Ifa*, and *Egungun* motifs as primary teaching tools.
4	CUL-D	Cultural Development	Measuring the growth of cultural preservation through art-making.
5	CSP	Culturally Sustaining Pedagogy	Teaching methods that actively keep local traditions alive in the classroom.

Table 5 explains the most profound finding lies in the "Praxis of Reclamation." Educators reported that when they shift towards Culturally sustaining pedagogy (CSP), the classroom environment undergoes a transformation. By centering Yoruba Iconography (Y-ICON) such as the geometry of *Eyo, Egungun, Adire*, and *Ifa* motifs — students experience a surge in Cultural Identity (CUL-ID). This is Indigenous Knowledge (IND-K) in motion. It transforms the syllabus from a Western "Window" into a local "Mirror," validating the student's heritage as academically significant.

Table 6: Cluster III — The Student Window (Engagement & Outcome)

S/N	Abbreviation	Code	Research Application / Analysis
1	STU-E	Student Engagement	The behavioural intensity and emotional investment of students towards learning in Fine arts.
2	STU-M	Student Motivation	The mind-set and academic spark that occurs when students see their own lives in the curriculum.
3	ACA-P	Academic Participation	The involvement of arts students in school-wide academic dialogues.
4	AC-SELF	Academic Self-Efficacy	The boost in student confidence that transfers to other school subjects.
5	CUL-CAP	Cultural Capital	The social "currency" students gain when local knowledge is validated.

Table 6 analyses the outcome of the pedagogical shift. The data indicates that Student Motivation (STU-M) is directly tied to representation in the curriculum. Higher Student Engagement (STU-E) was recorded when lessons moved from generic subjects to Creative Expression (CRE-X) based on local coastal narratives. This builds Academic Self Efficacy (AC-SELF). Students who excel in a culturally-validated art studio carry that confidence into other subjects, effectively building Cultural Capital (CUL-CAP).

Table 7: Cluster IV — The Transformative Praxis (The Solution)

S/N	Abbreviation	Code	Research Application / Analysis
1	MARG-C	Marginalized Communities	The specific focus on schools found in underserved areas of the Agbara and Ojo LGAs.
2	CRE-X	Creative Expression	The synthesis of local culture into original, contemporary visual works.
3	CRE-COM	Creative Competencies	Professional skills that bridge the gap between school and the creative industry.
4	ART-I	Art Integration	Strategies for using visual arts to explain history, math, or social studies.
5	ACC-Q	Access to Quality Education	Ensuring students living or schooling in marginalised communities receive a balanced, and quality access to learning.

Table 7 demonstrates that Access to Quality Education (ACC-Q) in Southwest Nigeria must include vocational agency. The integration of Creative Competencies (CRE-COM) and Art-preneurship allows students to see a "Window" to creative economy particularly in Lagos State. In Marginalised Communities (MARG-C), the arts when integrated via Art Integration ART-I — act as a vital hedge against Educational Inequality (EDU-IQ), providing a pathway to both identity and industry.

4. Discussion and Analysis

4.1 Thematic Synthesis: The Tension Between STEM-P AND Y-ICON

The most critical finding of this research is the conflict that exist between the systemic pressure and the aspirations towards incorporating cultural responsive pedagogy into the traditional teaching methods of fine art in secondary schools — with the motivation of exploring how educators can possibly navigate the 6-3-3-4 Science Bias (STEM-P) to implement cultural context such as Yoruba Iconography (Y-ICON) found in the south-western part of Nigeria. The data collected under the Resource Deficit (RES-D) code suggests that the physical environment of the public schools selected in Agbara and Ojo Local Government Areas, actively works against accessing quality creative and technical courses that largely build on practical, in which Fine Arts Education (FAE) is not exempted — this is because the system prioritizes core vocational-technical and science-based subjects. One participant noted that “art activities are conducted in shared classroom spaces. Also, the study identifies an imperative "Pedagogical Workaround": as it was observed that some of the educators are using local clays or natural dyes from coastal plants to circumvent the lack of imported materials. This significantly exposes that RES-D does not completely result in a halt of education; rather, it forces a shift toward Culturally Sustaining Pedagogy (CSP) out of necessity.

Thus, the analysis of Y-ICON code reveals that Yoruba visual symbols are not merely "decorations" but cognitive tools. During the dyadic interviews, teachers explained that using *Adire* motifs to teach geometric principles or *Egungun* visual narratives to teach social history can create a "Mirror" that improves Student Engagement (STU-E). When the curriculum moves away from Curriculum Bias (CUR-B), students stop seeing art as a foreign subject. This shift directly influences Academic Participation (ACA-P) across other humanities subjects, as students feel more academically inclined.

4.2 The Art-preneurial Perspective: From Marginalization to Agency

In Marginalized Communities (MARG-C), the goal of education is often tied to survival. However, the study found that mastery of Creative Competencies (CRE-COM) will eventually provide students self-reliance also a unique form of cultural capital that will help in the industrial world. For instance, Nigeria is a country where most parent aspires and enforces their children to become a "science-literate" which is common around the world, but there are lesser or no opportunity of applying their knowledge or making it through in the industry due to lack and lesser concerns about infrastructures and technological innovations, but being culturally and creatively literate" is a rare asset in a country like Nigeria and other neighbourhood African countries. Actually, it is for a fact that the creative industries have given hard working and talented children that exists in marginalised communities the opportunities to achieve their dreams in professional fields such as music, sports, theatre, cultural and creative arts, and dance. Hence, if interested students can focus on Art-entrepreneurship Economics (AP-EC) skills i.e. learning to monetize their Creative Expression (CRE-X), particularly in a world where the economy seems fuzzy — this transforms the creative industry which fine arts is inclusive from a marginal pursuit into a tool for Access to Quality Education (ACC-Q).

5. Conclusion and Recommendations

5.1 Conclusion

The findings obtained from the exploratory qualitative analysis of this paper shows that Nigeria’s 6-3-3-4 school system focuses too heavily on science-based subjects, and more theoretical aspect of all subjects than practical. However, this STEM prioritization is the reason behind curriculum bias — which is due to lack of educational resources and infrastructures which backs the claims of

resource deficit in creative industries. As a result of these issues, this study shows that fine arts education is pushed aside in the poor industrial and coastal areas of Lagos and Ogun States. Moreover, by upgrading the standard research methods into the suggested enhanced mixed-methods framework, this paper proves that cutting arts budgets would create worse educational inequality and stops unprivileged students from getting access to quality education.

Contextually, when a teacher uses Culturally Sustaining Pedagogy (CSP) that focuses on indigenous themes and concepts such as Yoruba iconography as seen in Table 1 of this paper — however, they bring vitality of indigenous knowledge into the classroom that transcends to build stronger cultural identity. So therefore, when students see their own culture valued and not demeaned, it makes them motivated and their student engagement increase significantly. This excitement extends into other classes, whereby improving general academic participation and boosting academic self-efficacy.

Finally, it is safe to say that practical skill, talents, creative expression, and creative competencies found in marginalised communities act as a valuable cultural capital. Incorporating art classes with entrepreneurial knowledge such Art-preneurial economics would project school into the real-world system of yielding economic benefits.

5.2 Recommendations

The following are imperative to redress the gaps of Fine Arts Education pedagogy in Nigeria:

Proper Restructuring of the Syllabus: The Nigerian Educational Research and Development Council (NERDC) must remove Western curriculum bias and ensure that they significantly shift the focus from European art history only; to a merge of global concepts with our cultural identity and indigenous knowledge.

Build and Fund Art Studios: The Federal and State Ministries of Education must reduce excessive prioritization of STEM disciplines. They need to pass laws that encourage implementation across public schools to build and supply proper art studios alongside science labs. This will end the chronic deficit of resources in the system.

Integrate Entrepreneurial Skills to Art Classes: School leaders can also ensure that educators connect to art-preneurial economics by moving from just drawing on paper and focusing on real cognitive competencies like digital design and fabric printings, this is due to the fact that the world has significantly tilted to incorporating artificial intelligence in varied works of disciplines. This gives young people practical business skills they can use to make a living right beyond education.

Train Teachers Properly: State school boards (SUBEB) across Lagos and Ogun States can also set up mandatory teacher professional development programs across diverse disciplines in education. These workshops should ensure that teachers know how to use the right instruments and teaching tools. This will guarantee students access to quality education.

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