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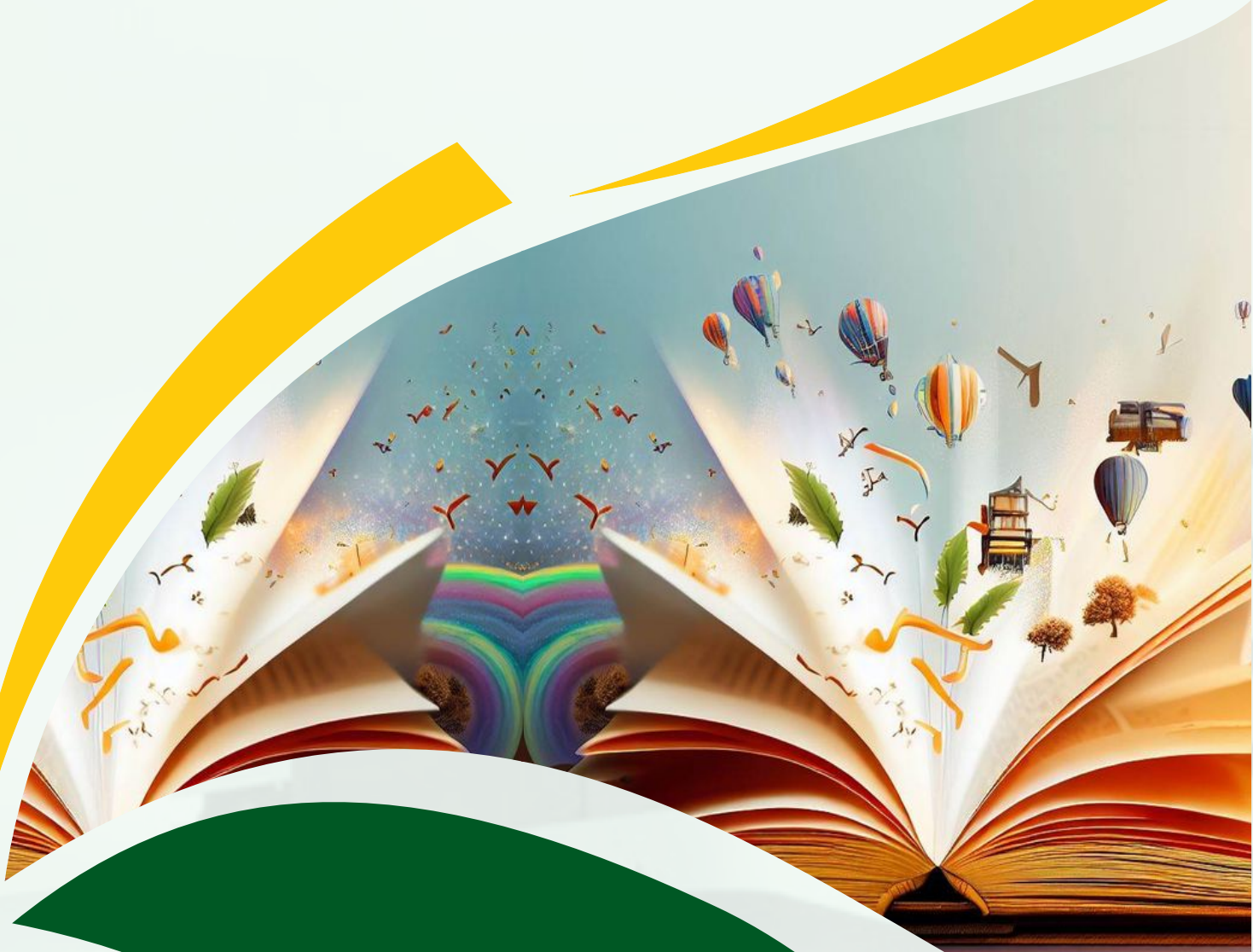

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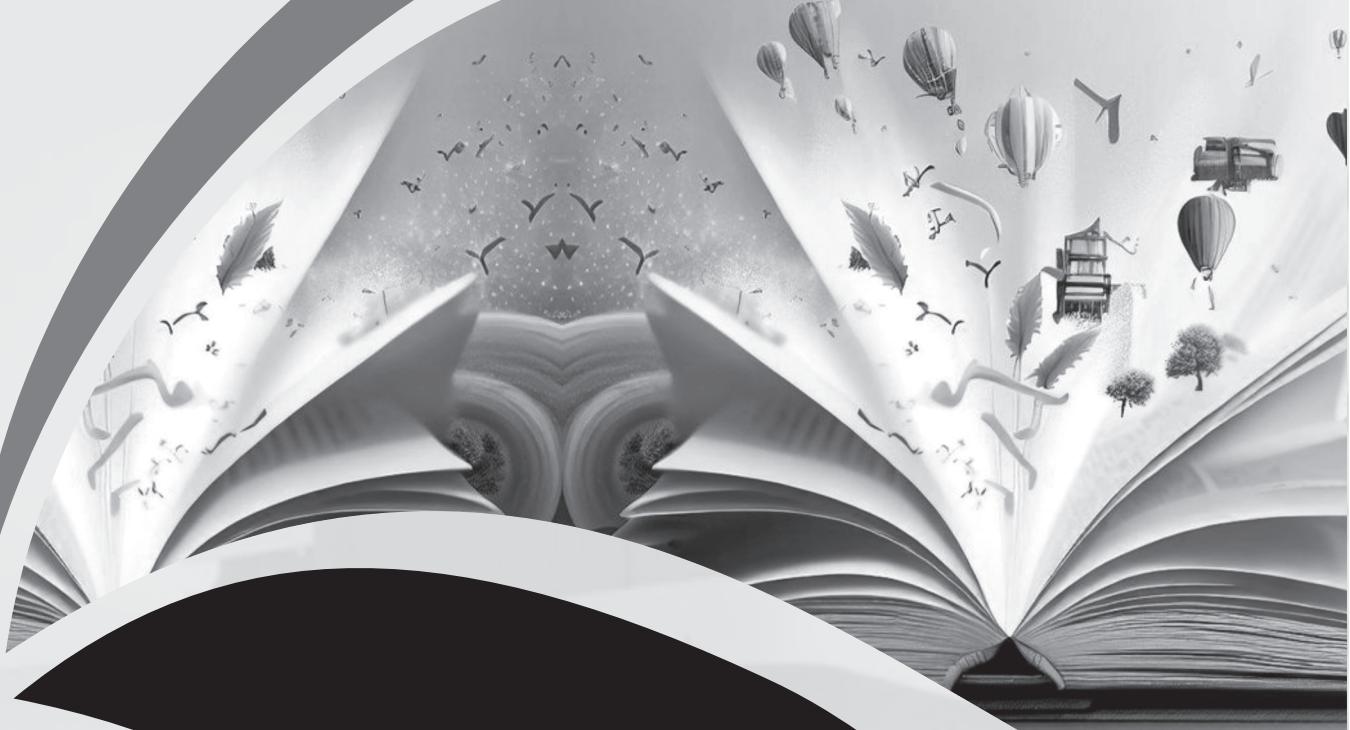

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TABLE OF CONTENTS

SOCIO-ECONOMIC FACTORS AS DETERMINANTS OF SEXUAL COERCION AMONG MALE AND FEMALE STUDENTS IN OSUN STATE TERTIARY INSTITUTIONS, NIGERIA
AKINNUBI CAROLINE F., Ph.D 01-07

EFFECTS OF YORUBA POEMS AND FOLKTALES PACKAGES ON LOWER BASIC SCHOOL PUPILS' YORUBA VOCABULARY DEVELOPMENT IN ONDO STATE
ALEX-FASEGHA, O. E., ODEJOBI, C. O. AND OKEWOLE, J. O. 08-19

USE OF VISUAL MATERIALS FOR THE TEACHING OF MORPHOLOGY IN ENGLISH LANGUAGE IN JUNIOR SECONDARY SCHOOLS IN ISOKAN LOCAL GOVERNMENT AREA, OSUN STATE
SALAMI JOSHUA OLAYEMI 20-27

APPRAISAL OF THE NATIONAL SCHOOL HEALTH POLICY IMPLEMENTATION FOR HEALTH SECURITY IN OSUN STATE, NIGERIA SECONDARY SCHOOLS
AKINOLA OLUWATOYIN BOLANLE 28-36

INSECURITY: A BANE TO EDUCATIONAL MANAGEMENT OF SECONDARY EDUCATION IN NIGERIA
EUNICE OLUWABUKUNMI APARA 37-45

PSYCHOSOCIAL ADJUSTMENT OF RETIRED UNIVERSITY STAFF AFTER RELOCATING FROM UNIVERSITY STAFF QUARTERS IN SOUTHWESTERN NIGERIA
DR. OBAISI J. C. & PROF. B. I. POPOOLA 46-52

DEPICTION OF OSUN OSOGBO FESTIVAL VIA TEXTILE DESIGN FOR GARMENTS
OGUNDIPE, VICTORIA ABIMBOLA, Ph.D. 53-61

EFFECT OF STATION–ROTATION STRATEGY OF BLENDED LEARNING ON STUDENTS' ACADEMIC PERFORMANCE AND ATTITUDE TOWARD MATHEMATICS AMONG SECONDARY SCHOOL STUDENT'S IN KATSINA METROPOLIS, KATSINA STATE
STEPHEN ILESANMI AJIBOYE, JIMOH MUKHTAR & HAJARA ABDULRAHMAN BABA 62-69

PSYCHOLOGICAL EFFECTS OF INSECURITY ON BASIC EDUCATOR'S LEARNING AND DEVELOPMENT IN OYO NORTH SENETORIAL DISTRICT OYO STATE, NIGERIA
OLOYEDE AKINNIYI OJO Ph.D. 70-78

ASSESSMENT OF LECTURERS' INTERNET SKILLS AND E-LEARNING ACCEPTANCE IN COLLEGES OF EDUCATION IN OSUN STATE
OYENIRAN OYETOLA 79-85

EFFECTS OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ON ACADEMIC ACHIEVEMENT OF SENIOR SECONDARY SCHOOL STUDENTS IN BIOLOGY
DR. FOLASADE OLUYEMISI OLAYINKA, DR. SUNDAY ADE.ADENIRAN, DR. GABRIEL ADERIBIGBE OYEGBAMI, MR. AHMAD MUHAMMAD ABBAS & DR. ADESINA ISAAC OKUNADE 86-95

PRE-SERVICE TEACHERS' PERCEPTION OF INSECURITY AND POVERTY IN NIGERIA: IMPLICATIONS FOR SCIENCE, TECHNOLOGY, MATHEMATICS (STM) EDUCATION
ADENIKE J. OLADIPO &RACHAEL O. OKUNUGA 96-106

INSECURITY AS A PREDICTOR OF POVERTY IN NIGERIAN EDUCATIONAL SYSTEM: IMPLICATIONS FOR STEM EDUCATION
ADENEYE O. A. AWOFALA, &ADENIKE J. OLADIPO 107-117

PRE-SERVICE TEACHERS' PERCEPTION OF INSECURITY AND POVERTY IN NIGERIA: IMPLICATIONS FOR SCIENCE, TECHNOLOGY, MATHEMATICS (STM) EDUCATION

[1]Adenike J. Oladipo & [2]Rachael O. Okunuga
[1]Department of Education, Distance Learning Institute, University of Lagos.
[2]Department of Science Education, Faculty of Education, University of Lagos
E-mail: [1]adeoladipo@unilag.edu.ng [2]rokunuga@unilag.edu.ng
Corresponding author: [2]rokunuga@unilag.edu.ng

Abstract
The United Nations, at its general assembly in September 2015, adopted the 2030 Agenda for Sustainable Development. Several of the agenda items address poverty and insecurity because of their interconnectedness. However, Nigeria faces challenges in these two areas, which also have far-reaching effects on its Education. Hence, this study investigated pre-service teachers' perceptions of insecurity and poverty in Nigeria and explored the implications for STM Education. A mixed-methods approach of both quantitative and qualitative data collection methods with a valid and reliable instrument, the Perception of Insecurity and Poverty Scale on Pre-Service Teachers (PISPST; Cronbach's alpha, α=0.84), was adopted. The instrument was administered to 300 Pre-service teachers in science, mathematics, and technology departments in a first-generation Nigerian university, followed by a focus group discussion with 20 purposively selected participants. The results showed that pre-service teachers perceived insecurity and poverty as significant challenges affecting the quality of education in Nigeria. They also identified inadequate infrastructure, lack of access to quality educational resources, and insufficient teacher training as major inhibitions to effective STM Education. Additionally, the study revealed pre-service teachers' perception, as they posited that insecurity and poverty were responsible for the decrease in student enrolment in schools, an increase in students' dropout rates, and ultimately a reduction in academic performance in STM subjects. Based on the findings of this study, policymakers and stakeholders must invest in improving educational infrastructure, providing access to quality resources, and ensuring teachers' safety and well-being.

Keywords: Pre-service teachers, insecurity, poverty, STM education, STM

Introduction

The issues of insecurity and poverty is global and significant. It is underscored by their inclusion in the United Nations' 2030 Agenda for Sustainable Development, specifically in Goals 1 (No Poverty), 4 (Quality Education), and 16 (Peace, Justice, and Strong Institutions) (United Nations, 2019).Nigeria, despite being Africa's largest economy with abundant natural resources, continues to grapple with the dual challenges of insecurity and poverty, which have profound implications for its educational system (Adelaja et al., 2022). The interconnectedness of these challenges presents a complex problem requiring systematic solutions, particularly within the context of Science, Technology, and Mathematics (STM) education fields critical to national development and global competitiveness (Ogundele & Chukwuma, 2022).

Pre-service teachers, as future educators who will shape the next generation of Nigerian students, offer a unique and valuable perspective on these challenges. Their perceptions and experiences provide crucial insights into the realities of teaching and learning within this context, particularly in STM fields, which require specialized resources, stable learning environments, and consistent educational progression (Olasehinde-Williams et al., 2022).By understanding these perceptions, this research aims to inform policy decisions and educational interventions that can effectively address these challenges and improve educational outcomes in STM disciplines. The findings are particularly significant given Nigeria's aspirations for technological advancement and economic diversification, which heavily depend

on a robust STM education system (Ogunmade, 2020).

Recent statistics indicate that approximately 13.2 million Nigerian children are out of school. The highest figure globally, with a disproportionate impact on northern regions affected by insurgency and banditry (UNICEF, 2022). Furthermore, the poverty rate stands at 40.1%, meaning that over 83 million Nigerians live below the poverty line, creating substantial barriers to educational access and quality (World Bank, 2023).

Statement of the Problem

Insecurity and poverty are deep-rooted issues in Nigeria, overwhelmingly affecting the educational system. Pre-service teachers, being important in molding the next generation of citizens, harbor diverse perceptions of these challenges, which can significantly influence their teaching practices and commitment to the profession. The impact of insecurity and poverty on education is multifaceted, ranging from inadequate infrastructure and resources to heightened stress and decreased motivation among students and teachers alike. Understanding pre-service teachers' perceptions of these issues is crucial, particularly in Science, Technology, and Mathematics (STM) education, which plays a vital role in driving national development, innovation, and economic growth. It is in this light, thatthis study examined how pre-service teachers in Nigeria perceive the impact of insecurity and poverty on education, with particular attentionto implications for STM education and identifying potential strategies to mitigate these challenges, enhance educational outcomes, and foster national progress.

Research Objectives

The main purpose of the study is to investigate the perception of pre-service teachers on the implications of insecurity and poverty on STM education. The specific objectives are to:

1. Examine pre-service teachers 'interconnections between insecurity and poverty as they affect STM education in Nigeria.
2. Identify the challenges pre-service teachers anticipate facing in delivering quality STM education in contexts affected by insecurity and poverty.
3. Examine pre-service teachers' perceptions on the implications of insecurity and poverty for curriculum development, teacher preparation, and policy interventions in STM education.

Research Questions

The following research questions were answered.

1. What interconnections do pre-service teachers identify between insecurity and poverty as they affect STM education in Nigeria?
2. What specific challenges do pre-service teachers anticipate facing in delivering quality STM education in contexts affected by insecurity and poverty?
3. What implications do pre-service teachers' perceptions of insecurity and poverty have for curriculum development, teacher preparation, and policy interventions in STM education?

Literature Review]

Theoretical Framework

This study is grounded in theoretical frameworks that help contextualize the relationship between insecurity, poverty, and educational outcomes. Maslow's Hierarchy of Needs (Maslow, 1954) provides a fundamental framework for understanding how basic security and physiological needs must be satisfied before higher-order learning can effectively occur. In the Nigerian context, where safety concerns and basic needs remain unmet for many students and teachers, this theory offers valuable insights into educational challenges (Falode et al., 2022).

Educational Deprivation Theory, as articulated by contemporary scholars, posits that systematic barriers to quality education perpetuate cycles of poverty and underdevelopment (Jegede, 2020). This perspective is particularly relevant when examining how insecurity and poverty create conditions that limit access to quality STM education, thereby restricting opportunities for socioeconomic mobility and national development (Agbo & Isa, 2022).

Additionally, Social Cognitive Theory (Bandura, 1986) provides a framework for understanding how environmental factors

influence learning outcomes through their impact on cognitive processes, motivation, and self-efficacy. Obi et al. (2021) applied this framework to the Nigerian context, demonstrating how insecure learning environments negatively affect teacher efficacy and student achievement, particularly in resource-intensive subjects like science and technology.

Insecurity and Education in Nigeria

The security situation in Nigeria has deteriorated significantly over the past decade, with multiple forms of insecurity affecting different regions. Boko Haram insurgency in the Northeast, banditry in the Northwest, farmer-herder conflicts in the North-central, secessionist agitations in the Southeast, and kidnapping across various regions have created a complex security landscape with direct impacts on education (Okoye et al., 2022).

Recent research by Ugwuanyi and Nwankwo (2023) documented over 1,500 school-related attacks in Nigeria between 2018 and 2022, including school abductions, teacher kidnappings, and destruction of educational infrastructure. These security challenges have led to prolonged school closures, teacher attrition, and psychological trauma among educational stakeholders (Otekunrin et al., 2022). A study by Nnadi and Udoye (2022) found that schools in high-insecurity regions experienced up to 60% reductions in instructional time due to security concerns, with STM subjects particularly affected due to their sequential and cumulative nature.

The gendered dimension of educational insecurity has been highlighted by Okafor and Emeka (2021), who noted that female students in northern Nigeria face additional barriers to STM education due to gender-based violence and cultural factors exacerbated by insecurity. This intersection of gender, insecurity, and educational access has significant implications for gender diversity in STM fields and broader societal development.

Poverty and Educational Outcomes

Poverty creates multifaceted barriers to quality education in Nigeria. A comprehensive study by Odili and Mohammed (2022) identified several mechanisms through which poverty impacts educational outcomes, including inability to afford educational materials, malnutrition affecting cognitive development, child labor reducing study time, and limited access to supplementary educational resources.

The relationship between poverty and STM education is particularly pronounced. Research by Adeyemo and Olawale (2023) demonstrated that students from low-income backgrounds in Nigeria scored significantly lower on standardized mathematics and science assessments compared to their more affluent peers, with the gap widening at higher educational levels. This disparity was attributed to limited access to laboratory facilities, technological resources, and qualified teachers in low-income communities.

Intergenerational aspects of educational poverty were highlighted by Ibrahim and Ogbonnaya (2021), who documented how parental educational and income levels predict children's achievement in STM subjects. Their longitudinal study showed that interventions targeting both economic support and parental engagement were more effective in improving STM outcomes than either approach alone.

Pre-service Teachers and Educational Challenges

Pre-service teachers occupy a unique position at the intersection of educational theory and practice. Kola and Audu (2022) characterized pre-service teachers as "educational bridge-builders" who connect academic knowledge with classroom realities. Their perceptions of educational challenges provide valuable insights into both the theoretical understanding of issues and the practical implications for teaching and learning.

Research by Amadi and Johnson (2022) found that pre-service teachers in Nigeria demonstrated high awareness of systemic educational challenges but varied significantly in their perceived ability to address these challenges in their future classrooms. Factors influencing this self-efficacy included quality of teacher education, exposure to diverse educational settings, and personal experiences with educational barriers.

In the context of STM education, Nworu and Odukoya (2021) documented how pre-service teachers' attitudes toward teaching STM

subjects were influenced by their perceptions of resource availability, security, and community support. Those anticipating resource-poor or insecure environments reported lower intentions to specialize in STM teaching, contributing to teacher shortages in these critical subjects.

STM Education in Nigeria: Current Status and Challenges

STM education in Nigeria faces substantial challenges beyond those affecting the broader educational system. Oyekan et al. (2023) conducted a comprehensive assessment of STM education across Nigerian states, finding that only 23% of secondary schools had functional science laboratories, while just 12% had computer laboratories meeting minimum standards. This infrastructure deficit severely limits practical learning experiences essential for STM mastery.

Teacher quality in STM subjects presents another challenge. Usman and Danjuma (2022) reported that 47% of teachers handling STM subjects in Nigerian public schools lacked appropriate qualifications, with rural and conflict-affected areas experiencing higher proportions of unqualified teachers. This situation is compounded by "brain drain," as qualified STM teachers increasingly seek opportunities abroad or in private institutions offering better compensation and security (Abiodun & Obafemi, 2022).

Curriculum relevance and implementation represent additional challenges. Despite efforts to update the national STM curriculum, Ezeani and Nwagbo (2023) found significant gaps between curriculum content and implementation realities in Nigerian classrooms. Their study identified inadequate teacher preparation, resource limitations, and assessment methods focused on rote learning rather than conceptual understanding and application as key barriers to effective STM education.

The literature reveals significant gaps regarding how pre-service teachers perceive the specific impact of insecurity and poverty on STM education in Nigeria. While extensive research has documented these challenges separately, fewer studies have examined their intersection from the perspective of those preparing to enter the teaching profession. This study addresses this gap by exploring pre-service teachers' perceptions of these issues and their implications for STM education.

Methodology

This study employed a mixed-methods of quantitative and qualitative research design. 300 pre-service teachers in science, mathematics, and technology education departments were selected using stratified random sampling to ensure proportional representation across disciplines, gender, and academic levels. The sample consisted of 168 males (56%) and 132 females (44%), with representation across mathematics education (n=98, 32.7%), science education (n=115, 38.3%), and technology education (n=87, 29%). For the qualitative phase, 20 participants were purposively selected from the initial sample to participate in focus group discussions. The selection criteria include high-qualityresponse in the quantitative phase, disciplinary representation, and willingness to participate in extended discussions. This approach allowed for deeper exploration of themes identified in the quantitative analysis.

The Perception of Insecurity and Poverty Scale on Pre-Service Teachers (PISPST), a validated instrument developed specifically for this study. The PISPST consisted of 35 items across five dimensions. Each item was rated on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Content validity index was calculated at 0.87, indicating strong content validity. Reliability testing with a pilot sample of 50 pre-service teachers yielded a Cronbach's alpha coefficient of 0.84 for the overall scale, with subscale reliability coefficients ranging from 0.79 to 0.88, demonstrating strong internal consistency. The PISPST was administered in classroom settings with the assistance of research assistants trained in standardized administration procedures. Participants completed the instrument in approximately 25-30 minutes, with a response rate of 94% (300 valid responses from 320 distributed instruments).

For qualitative data collection, a semi-structured focus group discussion guide was developed based on preliminary quantitative findings. The guide contained open-ended questions designed to elicit detailed responses regarding participants' perceptions of insecurity

and poverty impacts on STM education, personal experiences, and suggested interventions. Four focus group discussions were conducted, each comprising five participants and lasting approximately 90 minutes. Discussions were audio-recorded with participants' consent and transcribed verbatim within 48 hours of completion.

Quantitative data were analyzed using descriptive statistics of means, standard deviations, frequencies, and percentages. Inferential analyses included t-tests and one-way ANOVA. Multiple regression analysis was conducted to identify factors predicting perceptions of STM-specific challenges.

Qualitative data underwent thematic analysis following Braun and Clarke's (2021) six-phase approach: familiarization with data, initial coding, theme development, theme refinement, theme naming, and report production. Coding comparisons yielded an inter-coder agreement of 88%, indicating strong reliability.

Results

Research Question One: What interconnections do pre-service teachers identify between insecurity and poverty as they affect STM education in Nigeria

Table 1: Descriptive analysis of pre-service teachers' perception of insecurity in Nigeria

Statement – insecurity	1	2	3	4	5	Mean	SD
Pre-service teachers' perception of insecurity in Nigeria							
Insecurity significantly affects educational processes in Nigeria	1	3	10	88	198	4.60	0.59
Kidnapping of students and teachers is a severe security concern affecting education	1	2	5	24	268	4.85	0.46
Terrorist activities significantly affect school operations	2	3	7	42	246	4.76	0.53
Community violence disrupts educational continuity	2	5	13	68	212	4.61	0.64
Pre-service teachers' perception of poverty in Nigeria							
Poverty significantly impacts educational quality and access	2	4	9	96	189	4.58	0.63
Inability to afford educational materials hinders learning in STM subjects	1	2	4	30	263	4.82	0.48
Malnutrition affects students' learning capacity in technical subjects	1	3	8	47	241	4.71	0.56
Child labor reduces time available for studying STM subjects	2	3	7	56	232	4.67	0.59
Perceived Impact on STM Education Quality and Access							
Insecurity and poverty lead to decreased enrollment in STM subjects	1	2	6	52	239	4.76	0.53
Insecurity and poverty contribute to increased dropout rates among STM students	1	3	7	53	236	4.72	0.55
Insecurity and poverty result in reduced academic performance in STM subjects	2	2	8	58	230	4.68	0.58
Insecurity and poverty limit access to practical learning experiences essential for STM education	1	1	5	45	248	4.79	0.49
Pre-service Teachers' Identified Challenges for STM Education							
Inadequate infrastructure will be a significant challenge in teaching STM subjects	1	1	3	27	268	4.87	0.42
Limited access to quality educational resources will hinder effective STM instruction	1	2	4	29	264	4.83	0.45
Insufficient teacher training will impact my ability to deliver quality STM education	1	2	7	48	242	4.76	0.52

Results based on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree); N = 300

From Table 1, quantitative findings revealed high levels of concern regarding insecurity among pre-service teachers in Nigeria. On a 5-point scale, participants reported a mean score of 4.62 (SD = 0.58) for perceptions of general insecurity's impact on education, indicating strong agreement that security challenges significantly affect educational processes. Specific security concerns ranked by perceived severity included

- kidnapping of students and teachers (M = 4.87, SD = 0.43),
- Terrorist activities affecting school operations (M = 4.79, SD = 0.51), and community violence disrupting educational continuity (M = 4.65, SD = 0.62).

The qualitative data provided deeper insights into these perceptions. Focus group participants consistently described security as a "foundational requirement" for effective education.

Table 1 also showed strong awareness of poverty's educational impact among pre-service teachers, with a mean score of 4.58 (SD = 0.63) on the poverty perception scale.

The most significant poverty-related barriers to education identified by participants included inability to afford educational materials (M = 4.82, SD = 0.48), malnutrition affecting learning capacity (M = 4.71, SD = 0.56), and child labour reducing study time (M = 4.67, SD = 0.59). Focus group discussions revealed nuanced perspectives on poverty's relationship with education. Participants consistently described a "poverty cycle" in which limited education perpetuates poverty, which in turn restricts educational access.

A key finding was the strong perceived interconnection between insecurity and poverty in creating educational barriers.

Correlation analysis revealed a significant positive relationship between perceptions of insecurity impact and poverty impact ($r = 0.76$, $p < .001$), indicating that participants who perceived high security barriers also recognized substantial poverty-related challenges.

Focus group discussions elaborated on this relationship. Participants described a "downward spiral" in which insecurity exacerbates poverty through economic disruption, while poverty creates conditions conducive to insecurity through decreased social cohesion and increased vulnerability.

Regression analysis indicated that the combination of perceived insecurity and poverty significantly predicted concerns about STM educational quality ($R^2 = 0.68$, $F(2,297) = 314.89$, $p < .001$), with both variables making significant individual contributions to the prediction model (insecurity: $\beta = 0.42$, $p < .001$; poverty: $\beta = 0.39$, $p < .001$).

Research Question Two: What specific challenges do pre-service teachers anticipate facing in delivering quality STM education in contexts affected by insecurity and poverty?

From Table 1, participants identified specific challenges facing STM education in contexts affected by insecurity and poverty:

- inadequate infrastructure (M = 4.87, SD = 0.42),
- lack of access to quality educational resources (M = 4.83, SD = 0.45), and
- insufficient teacher training (M = 4.76, SD = 0.52) were perceived as the most significant barriers.

Focus group discussions elaborated on these challenges. Regarding infrastructure, participants consistently mentioned laboratory facilities, technology access, and safe learning environments as critical needs.

Research Question Three: What implications do pre-service teachers' perceptions of insecurity and poverty have for curriculum development, teacher preparation, and policy interventions in STM education?

Participants identified specific mechanisms through which insecurity and poverty affect STM education.

Quantitative data revealed strong agreement that these challenges impact STM education through decreased enrollment (M = 4.76, SD = 0.53), increased dropout rates (M = 4.72, SD = 0.55), reduced academic performance (M = 4.68, SD = 0.58), and limited access to practical learning experiences (M = 4.79, SD = 0.49).

Focus group discussions provided deeper insights into these perceptions. Participants

consistently highlighted the practical, sequential, and resource-intensive nature of STM education as factors making it particularly vulnerable to insecurity and poverty impacts. A science education student explained:

> "*Science education builds step by step. When students miss school due to insecurity or poverty, they lose foundational knowledge. In my teaching practice, I noticed students who had missed previous units struggled to understand current concepts that built on earlier knowledge.*"

Participants emphasized three primary pathways through which insecurity and poverty affect STM education: resource limitations, instructional disruptions, and psychological impacts. Regarding resource limitations, a technology education student noted:

> "*In poor and insecure areas, schools can't afford or maintain laboratories and technology. STM becomes theoretical rather than practical, severely limiting understanding and application.*"

Concerning instructional disruptions, participants highlighted the cumulative learning loss in STM subjects. A mathematics education student observed:

> "*Mathematics requires continuous practice and building on previous knowledge. When insecurity causes school closures or poverty forces students to attend irregularly, these disruptions have outsized impacts on mathematical understanding compared to some other subjects*."

The psychological impact on learning emerged as a significant theme. Participants described how safety concerns and economic stress create cognitive barriers to learning complex STM concepts. As one participant explained:

> "*When students are worried about safety or hungry due to poverty, they can't concentrate on challenging scientific concepts that require focused attention. Basic needs must be met before higher-order learning can occur.*"

These findings extend previous research by Nnadi and Udoye (2022) on instructional time loss by specifically examining how pre-service teachers anticipate these disruptions affecting STM education. The current study contributes new insights regarding the psychological dimensions of insecurity and poverty that may disproportionately impact learning in cognitively demanding subjects.

Implications for STM Education

Curriculum Development and Implementation

Participants specifically recommended curriculum adaptations including:

1. Development of "core concepts" frameworks that prioritize essential knowledge when instructional time is limited due to insecurity or economic constraints;
2. Integration of low-cost, locally available materials for scientific experimentation to address resource limitations in poverty-affected areas;
3. Creation of condensed practical modules that can be implemented during stable periods to compensate for laboratory access limitations.

A mathematics education student suggested:

> "*We need mathematics curricula that spiral key concepts throughout the year, so if students miss some classes due to insecurity or poverty-related absences, they have multiple opportunities to encounter foundational ideas*."

These suggestions align with recent curriculum innovations documented by Ezeani and Nwagbo (2023), who advocated for "resilient curriculum design" that maintains quality while adapting to challenging contexts.

Teacher Preparation and Professional Development

The study findings highlight significant implications for teacher preparation programs and professional development initiatives. Pre-service teachers expressed concern about

inadequate preparation for teaching in insecure or resource-limited environments. As one participant noted:

> "*Our training prepares us for ideal teaching conditions, not the realities we'll face. We need specific strategies for teaching STM subjects effectively despite insecurity and poverty constraints*."

Specific recommendations for teacher preparation emerged from both quantitative and qualitative data:

1. Integration of context-specific pedagogy in teacher education programs, including methods for effective STM instruction with limited resources;
2. Inclusion of security awareness and psychological support training to help teachers manage both their safety and students' emotional needs in insecure environments;
3. Development of technology-enhanced teaching skills that can facilitate remote instruction during periods of insecurity-related school closure.

These recommendations extend previous research by Kola and Audu (2022) on teacher preparation by specifically addressing the challenges of insecurity and poverty as they affect STM education. The current study contributes practical suggestions for enhancing teacher resilience and effectiveness in challenging contexts.

Conclusion

Key conclusions from the research include:

1. Pre-service teachers perceive insecurity and poverty as interconnected challenges that create multifaceted barriers to quality STM education through resource limitations, instructional disruptions, and psychological impacts on learning.
2. The sequential, practical, and resource-intensive nature of STM education makes it particularly vulnerable to disruptions caused by insecurity and economic constraints.
3. Inadequate infrastructure, limited access to quality educational resources, and insufficient teacher preparation represent significant barriers to effective STM education in insecurity and poverty-affected contexts.
4. Gender and disciplinary differences exist in how pre-service teachers perceive and anticipate addressing these challenges, with female participants expressing greater security concerns and technology education students reporting higher perceived resource barriers.
5. Adaptive curricula, context-specific teacher preparation, and targeted policy interventions represent promising approaches for improving STM education resilience in challenging contexts.

Addressing the challenges identified in this study requires coordinated efforts across multiple sectors, including education, security, and economic development. By recognizing the interconnected nature of insecurity, poverty, and educational outcomes, stakeholders can develop comprehensive approaches that enhance STM education quality and access for all Nigerian students, regardless of security conditions or economic circumstances.

Policy Implications and Recommendations

Focus group discussions yielded specific policy recommendations:

1. Development of "safe school initiatives" with enhanced security protocols and infrastructure for educational institutions in vulnerable areas;
2. Implementation of targeted economic support for STM education, including scholarships for students from poverty-affected communities and incentives for qualified teachers to work in underserved areas;
3. Creation of regional STM resource centers that can serve multiple schools, maximizing access to quality laboratories and technological resources despite economic constraints;
4. Integration of distance education options for periods of insecurity-related school closure, with particular attention to practical STM components.

A science education student explained:

> *"Policies must recognize that STM education has specific requirements beyond general education. When designing security or economic interventions, the particular needs of science, technology, and mathematics instruction, especially practical components, must be considered."*

These recommendations align with recent policy proposals by Adelaja et al. (2022) while providing specific applications for STM education in insecurity and poverty-affected contexts

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Ethical Consideration

Following ethical approval from the university's research ethics committee, the researchers obtained informed consent from all participants.