

Challenges Affecting Mathematics Learning and Performance

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Abstract - Mathematics occupies a central place in the development of scientific reasoning, technological capacity, and economic growth. Yet, for many students in Nigeria and across Sub-Saharan Africa, success in mathematics remains elusive. Persistent low performance in national examinations such as those conducted by the West African Examinations Council (WAEC) and the National Examinations Council (NECO), together with uneven outcomes in international assessments including the IGCSE and Cambridge examinations, continues to raise concern among educators and policymakers. This paper reflects on the factors that shape students' performance in mathematics through a critical engagement with Nigerian, African, and selected international studies. Rather than isolating a single cause, the review points to a combination of learner-related challenges, teacher practices constrained by limited professional support, institutional conditions marked by inadequate resources, and socio-cultural expectations surrounding mathematics. The paper argues that sustainable improvement in mathematics learning in Nigeria depends on coordinated, context-aware reforms that recognise the interconnected nature of these influences.

Keywords - Mathematics Education, Socio-Cultural Factors, Teacher Effectiveness and Teaching and Learning.

I. INTRODUCTION

Mathematics is commonly regarded as a foundational discipline for scientific inquiry, technological advancement, and innovation, and it plays a crucial role in both national development and individual empowerment. Beyond formal schooling, mathematical knowledge informs everyday reasoning, decision-making, and problem-solving across a wide range of social and professional contexts. Despite its recognised importance, however, mathematics remains one of the most challenging subjects for learners at different levels of education. Persistent

underachievement in mathematics has been reported globally and continues to be evident in both national and international assessments, including the West African Examinations Council (WAEC), the National Examinations Council (NECO), the International General Certificate of Secondary Education (IGCSE), and Cambridge International Examinations.

In Nigeria, the problem is particularly pronounced. For several years, students' performance in WAEC and NECO mathematics examinations has remained consistently low, with a large proportion of candidates failing to attain the credit-level passes required for entry into tertiary institutions. Similar patterns have been observed in other African countries, where mathematics achievement frequently lags behind that of other core subjects (Legotlo, Maaga & Sebegu, 2002; Mbugua et al., 2012). While these challenges are often associated with developing contexts, international studies indicate that difficulties in mathematics learning are not confined to Africa alone. Learners in parts of Europe, Asia, and the Middle East also report negative perceptions of mathematics, commonly describing it as abstract, demanding, and anxiety-inducing (Alami, 2016; Banerjee, 2016).

Existing literature suggests that students' poor performance in mathematics cannot be attributed to a single cause. Rather, it reflects the interaction of multiple factors operating at different levels of the education system. At the learner level, low motivation, mathematics anxiety, and negative attitudes toward the subject have been shown to impede learning (Chinn, 2012; Siebers et al., 2015). Teacher-related factors are equally significant, with studies linking weak student outcomes to limited pedagogical competence, insufficient subject mastery, and restricted opportunities for professional development (Makgato & Mji, 2006; Mbugua et al., 2012). These challenges

are often compounded by institutional constraints, including inadequate instructional resources, overcrowded classrooms, weak school leadership, and rigid curricula that limit effective teaching and learning (Kiwanuka et al., 2015).

At the international level, disparities in mathematics achievement are also evident in IGCSE and Cambridge assessments, where students from under-resourced educational systems frequently perform below their counterparts in countries with well-established infrastructures and coherent education policies. High-performing systems such as Singapore, South Korea, and Finland consistently demonstrate strong outcomes in mathematics, largely due to their emphasis on conceptual understanding, problem-solving, sustained teacher development, and effective collaboration between schools and families (OECD, 2019). This broader context highlights the need for Nigeria and other developing countries to critically examine local challenges while drawing relevant lessons from international best practices.

Against this background, the present paper examines the factors contributing to poor performance in mathematics, with particular attention to student-related, teacher-related, institutional, and socio-cultural dimensions. By situating the Nigerian experience within a wider international context—especially in relation to WAEC, NECO, IGCSE, and Cambridge examinations—the study seeks to deepen understanding of the problem and to inform practical strategies for improving the quality of mathematics teaching and learning.

II. LITERATURE REVIEW

Mathematics education remains a central concern in Nigeria and other Sub-Saharan African countries due to its critical role in scientific, technological, and socio-economic development. Despite its importance, students' achievement in mathematics has remained persistently low, as reflected in recurring poor performance in West African Examinations Council (WAEC) and National Examinations Council (NECO) examinations, and in international assessments such as IGCSE and Cambridge (Mbugua et al., 2012; WAEC, 2019–2024). The literature consistently attributes this

underperformance to a combination of learner-related, teacher-related, institutional, socio-cultural, and systemic factors. At the learner level, attitudes, motivation, and self-efficacy play a decisive role in shaping achievement. Nigerian students frequently perceive mathematics as abstract and difficult, contributing to anxiety and disengagement, while effective study habits and positive dispositions are linked to improved outcomes (Sa'ad et al., 2014; Kwpublications, 2025; Frontiers in Education, 2025). Strong foundational knowledge is also critical, as deficiencies in early numeracy skills often impede comprehension of advanced concepts, a pattern confirmed by both national and international studies (Zakariya & Bamidele, 2016; Mullis et al., 2016).

Teachers remain central to improving learning outcomes, with instructional quality, subject mastery, and pedagogical strategies directly influencing student performance. In Nigeria, shortages of qualified mathematics teachers, reliance on teacher-centered methods, and limited professional development hinder effective instruction (Mbugua et al., 2012; Sahlberg, 2011). Recent studies highlight the benefits of inquiry-based learning, scaffolding, and technology-supported instruction in enhancing engagement and conceptual understanding, although implementation challenges persist in under-resourced schools (Albay, 2019; SpringerLink, 2025; SEAHi Publications, 2025). Institutional factors, including inadequate instructional materials, overcrowded classrooms, and weak school leadership, further constrain effective teaching and limit opportunities for individualized support (Aremu & Oluwole, 2001; Okeke, 2015). Similarly, curriculum design and assessment practices, which often emphasize rote memorization and procedural recall, do not adequately prepare students for application-based international examinations, exposing gaps in conceptual understanding (Owan, 2018).

Socio-cultural and environmental factors significantly shape learners' engagement with mathematics. Parental involvement, socio-economic status, cultural beliefs, gender stereotypes, and the language of instruction all influence student outcomes. Low parental literacy and poverty limit home support for learning, while cultural perceptions that mathematics

is inherently difficult or male-oriented reduce engagement, particularly among female students (Chinn, 2012; Abdulrahman & Ayyash, 2019). Linguistic barriers, especially in multilingual contexts where English is not the first language, further complicate the comprehension of abstract mathematical concepts. Examination systems both reflect and reinforce these challenges. Nigerian examinations, including WAEC and NECO, often prioritize procedural knowledge over reasoning and problem-solving, contrasting with international frameworks that emphasize application and conceptual understanding. Comparative studies reveal that high-performing countries, such as Singapore, Finland, and South Korea, achieve superior outcomes through integrated curricula, sustained teacher development, and supportive socio-cultural environments (Sahlberg, 2011; OECD, 2019).

In summary, mathematics performance in Nigeria is shaped by a complex interplay of factors at the learner, teacher, institutional, socio-cultural, and systemic levels. While much of the research has examined these elements in isolation, there is limited recent work that situates Nigerian students' performance within a comparative local–international context, particularly incorporating IGCSE and Cambridge frameworks alongside national assessments. Addressing this gap is essential for developing holistic, context-responsive strategies to enhance mathematics teaching and learning across Nigerian and Sub-Saharan African schools.

III. METHODOLOGY

This study employed a descriptive survey design to explore the factors influencing the teaching, learning, and performance of secondary school students in mathematics within Nigerian educational contexts. The descriptive survey approach was selected because it provides a systematic means of collecting data on respondents' experiences, attitudes, and perceptions while allowing for quantitative analysis of performance outcomes. This design is particularly suitable for examining the interplay among multiple variables—including teaching practices, student motivation, mathematics anxiety, and access to

learning resources—that collectively affect mathematics achievement.

The study population comprised secondary school students, mathematics teachers, and school administrators drawn from selected urban and rural areas in Nigeria. A stratified random sampling technique was applied to select 300 students, ensuring balanced representation across gender, school type (public and private), socio-economic status, and geographic location. This approach ensured that the sample reflected the diversity of educational experiences across Nigerian secondary schools and captured the influence of socio-economic and contextual factors on mathematics performance.

Data collection involved a combination of structured questionnaires and a standardized mathematics achievement test. The student questionnaire captured demographic information, study habits, access to learning resources, levels of mathematics anxiety, and perceptions of teaching quality. The teacher instrument assessed pedagogical content knowledge (PCK) and instructional practices in the classroom. The mathematics achievement test comprised 40 items modelled on national examination standards (WAEC and NECO) and international benchmarks (IGCSE and Cambridge), ensuring content validity and alignment with real-world academic expectations. Prior academic records were also incorporated to triangulate results and strengthen reliability. All instruments were administered under standardized conditions, and ethical approval was obtained prior to data collection, with respondents participating voluntarily.

Data analysis included descriptive statistics such as frequencies, means, and standard deviations to summarize respondent characteristics and key study variables, alongside inferential statistics, specifically correlation analysis, to examine the relationships between mathematics achievement and predictor variables. The sample consisted of a near-balanced gender distribution (51.3% male; 48.7% female), with a majority of students attending public schools (74%) and residing in urban areas (56%). Mathematics achievement displayed considerable variability ($M = 37.79$, $SD = 11.13$), with prior academic scores ($r = 0.55$) and teacher PCK ($r = 0.33$) positively associated

with performance, while mathematics anxiety exhibited a negative correlation ($r = -0.40$). Self-efficacy ($r = 0.40$), hours of study per week ($r = 0.32$), class size ($r = -0.27$), and availability of textbooks at home ($r = 0.22$) also showed moderate relationships with student outcomes.

Overall, this methodology provided a comprehensive framework for examining the complex interactions between learner characteristics, teacher quality, and institutional factors that influence mathematics performance in Nigerian secondary schools. The combination of stratified sampling, multiple data instruments, and robust statistical analysis ensured that the study produced reliable and contextually relevant insights capable of informing policy and practice in mathematics education.

IV. RESULTS

The study's descriptive analysis revealed that the sample of 300 secondary school students was fairly balanced by gender, with 51.3% male and 48.7% female participants. A majority of the students attended public schools (74%), and slightly more than half resided in urban areas (56%). Socio-economic status varied, with 44% of students from low-income households, 40% from middle-income, and 15.7% from high-income backgrounds. These distributions indicate that the sample captured diverse educational and socio-economic contexts, providing a representative perspective on the factors influencing mathematics achievement in Nigerian secondary schools.

Analysis of key study variables showed considerable variability in student performance and related factors. Mathematics achievement scores ranged from 10 to 71.6, with a mean of 37.79 ($SD = 11.13$), indicating substantial differences in student outcomes. Prior academic performance was moderately strong ($M = 55.95$, $SD = 15.01$), reflecting students' earlier achievements in mathematics. Teacher pedagogical content knowledge (PCK) also varied widely ($M = 63.58$, $SD = 12.44$), highlighting differences in instructional capacity across the sampled schools. Measures of student mathematics anxiety ($M = 3.12$, $SD = 0.84$) and self-efficacy ($M = 3.06$, $SD = 0.79$)

indicated that affective factors were prominent influences on learning, while study hours per week averaged 5.91 ($SD = 3.09$), reflecting varying levels of learner engagement outside the classroom. Classroom size averaged 52.65 students ($SD = 16.59$), typical of many Nigerian public schools, and the average number of textbooks available at home was 1.58 ($SD = 1.31$), indicating limited access to supplementary learning materials.

Correlation analysis revealed significant relationships between mathematics achievement and several predictor variables. Prior academic scores were positively correlated with mathematics performance ($r = 0.55$), confirming that foundational knowledge strongly predicts current achievement. Teacher PCK also showed a positive association ($r = 0.33$), demonstrating that teacher competence contributes meaningfully to student outcomes. Student-related factors played a notable role: mathematics anxiety exhibited a moderate negative correlation with performance ($r = -0.40$), while self-efficacy was positively correlated ($r = 0.40$). Study hours per week were moderately associated with performance ($r = 0.32$), highlighting the value of consistent study routines. Conversely, larger class sizes were negatively associated with achievement ($r = -0.27$), and access to textbooks at home was positively related, though to a lesser extent ($r = 0.22$).

These results indicate that mathematics achievement in Nigerian secondary schools is influenced by a combination of learner, teacher, and institutional factors. Students' prior knowledge, self-efficacy, and study habits interact with teacher quality and classroom conditions to shape learning outcomes, while affective factors such as anxiety can inhibit performance even when foundational skills are adequate. The findings underscore the importance of addressing multiple dimensions simultaneously—enhancing teacher training, improving instructional resources, reducing class sizes, and supporting learner motivation—to achieve meaningful improvements in mathematics performance.

V. CONCLUSION AND RECOMMENDATIONS

Conclusion

This study examined the factors contributing to poor performance in the teaching and learning of mathematics, drawing insights from both national and international perspectives. The results confirm that student-related factors such as prior achievement, self-efficacy, and anxiety play a significant role in mathematics performance. Equally important are teacher-related factors, particularly pedagogical content knowledge and instructional practices, which directly influence learning outcomes. Institutional and environmental conditions, including class size, availability of resources, and school type, also emerged as critical determinants.

The low average performance recorded among students echoes findings from previous research in Nigeria, other African countries, and global contexts such as IGCSE and Cambridge examinations, underscoring that mathematics underachievement is a widespread and multifaceted challenge. This study therefore emphasizes that improving mathematics achievement requires not only effective classroom teaching but also systemic reforms that address psychological, institutional, and socio-economic barriers to learning.

Recommendations

Based on the findings, the following recommendations are proposed:

- **Strengthening Foundational Knowledge:** Early intervention programs should be designed to address learning gaps from primary and junior secondary levels, as prior achievement is strongly linked to future performance.
- **Enhancing Teacher Competence:** Regular professional development programs focusing on pedagogical content knowledge, innovative teaching strategies, and use of technology should be prioritized for mathematics teachers.
- **Reducing Class Sizes:** Education stakeholders should implement policies to reduce student–teacher ratios, thereby creating opportunities for

personalized instruction and improved student engagement.

- **Addressing Affective Barriers:** Schools should integrate counselling, mentoring, and classroom practices that reduce mathematics anxiety and build student self-efficacy.
- **Improving Learning Resources:** Governments, NGOs, and private stakeholders should increase investment in textbooks, ICT tools, and digital resources to provide equitable access to quality learning materials.
- **Parental and Community Involvement:** Parents and guardians should be sensitized on the importance of supporting their children’s learning through supervision, encouragement, and creating enabling environments at home.
- **Benchmarking International Best Practices:** Nigerian schools and examination bodies (WAEC, NECO) should learn from international standards such as IGCSE and Cambridge curricula by adopting learner-centered approaches, problem-solving methodologies, and rigorous teacher training frameworks.

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