

Problems Associated with the Use of Mother-Tongue in the Teaching and Learning of Mathematics in Nigerian Primary Schools

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Abstract

The study focused on the problems associated with using the mother tongue in teaching and learning mathematics in Nigerian primary schools. Four research objectives, four research questions, and one hypothesis guided the study. A descriptive survey design was adopted for the study. The study was carried out in Sabon Gari LGA, Kaduna State. The sample for the survey comprised four hundred sixty-two (462) participants, comprising 127 primary school teachers and 335 primary school students drawn from the population of study using stratified random sampling. The instruments for data collection in this study were the Teacher Competency Assessment Questionnaire (TCAQ), designed to evaluate teachers' proficiency in mother-tongue mathematics instruction; the Mathematics Achievement Test (MAT) to measure students' mathematical performance; the Instructional Materials Assessment Checklist (IMAC) to assess the availability and quality of indigenous language teaching resources; and the Implementation Challenges Questionnaire (ICQ) to identify systemic barriers in mother-tongue mathematics education, and data was analysed using frequency and simple percentage, t-test, and mean scores ranking. The results revealed that the distribution of teachers' competency levels in mother-tongue mathematics instruction indicates that a significant proportion of teachers possess moderate competency, the availability of mother-tongue mathematics instructional materials varies significantly across different resource types, the t-test analysis indicates a statistically significant difference in student achievement based on the language of instruction, and the ranking of challenges in implementing mother-tongue mathematics instruction shows that lack of standardised terminology is the most significant barrier. Based on the findings, the researchers recommend that curriculum experts should develop standardised mathematical terminology in major Nigerian languages through a collaborative effort of linguists and mathematics educators, among others.

Keywords: Mother-Tongue, Primary Schools, Problems, Teaching, Mathematics, Instructional Materials, Teacher Competency.

Introduction

Mathematics stands as a fundamental pillar of human knowledge and intellectual development, serving as a universal language that transcends cultural and linguistic boundaries. As a core academic discipline, mathematics provides essential tools for problem-solving, logical reasoning, and critical thinking skills that are crucial for success in

both academic pursuits and real-world applications (Kumar et al., 2024). The significance of mathematics education extends beyond numerical computation, encompassing pattern recognition, spatial reasoning, and analytical skills that form the foundation for scientific advancement, technological innovation, and economic development in modern societies (Williams & Thompson, 2024; Ahmed & Bello, 2024). The implementation of mother-tongue instruction in mathematics has garnered significant attention due to Nigeria's rich linguistic landscape, encompassing over 500 indigenous languages (Adeleke et al., 2023). This linguistic diversity presents both opportunities and challenges in mathematics education, especially considering the National Policy on Education's mandate for mother-tongue instruction in early primary education (Federal Republic of Nigeria, 2014).

Recent empirical studies have demonstrated compelling evidence regarding the effectiveness of mother-tongue mathematics instruction. For instance, Usman and Lawal (2024) conducted a comprehensive study across six states, revealing that students taught in their mother tongue showed a 28% improvement in mathematical problem-solving compared to those taught in English. Similarly, Ibrahim and Oluwale (2018) found significant enhancement in conceptual understanding through mother-tongue instruction, though noting persistent implementation challenges in urban schools where multiple languages coexist. The cognitive benefits of mother-tongue mathematics instruction have been well-documented in recent literature. Ogunbiyi and Mohammed (2020) demonstrated that students receiving mother-tongue mathematics instruction exhibited superior performance in problem-solving tasks, although they encountered difficulties with standardised mathematical terminology. These findings align with Yakubu et al. (2021)'s longitudinal study, which showed a 35% improvement in mathematical reasoning among students taught in their native languages.

However, significant challenges persist in implementing mother-tongue mathematics instruction effectively. Amaechi and Igwe (2023) identified critical barriers, including insufficient teaching resources, inadequate teacher preparation, and limited standardisation of mathematical terms across various Nigerian languages. Furthermore, Olayinka and Adebayo (2024) highlighted the impact of socioeconomic factors and parental attitudes on the successful implementation of mother-tongue mathematics instruction. Given these complex dynamics, this study examines four critical variables: teachers' competency in mother-tongue mathematics instruction, availability of indigenous language instructional materials, students' mathematical achievement, and implementation challenges. Through a systematic investigation of these variables, the study aims to provide evidence-based insights for improving mother-tongue mathematics instruction in Nigerian primary schools, as suggested by recent educational research (Nnamdi & Okafor, 2019).

Statement of the Problem

Mathematics education in Nigerian primary schools faces a critical challenge in implementing mother-tongue instruction, despite substantial evidence supporting its

cognitive benefits. Recent studies indicate that while 78% of students demonstrate better conceptual understanding when taught in their native language, only 23% of primary schools effectively implement mother-tongue mathematics instruction (Adeleke & Ibrahim, 2024; Mohammed et al., 2022). This significant gap between research-supported benefits and practical implementation is exacerbated by systemic challenges including inadequate teaching resources, insufficient teacher training, and notable resistance from various stakeholders. Furthermore, the absence of standardized mathematical terminology across Nigeria's diverse indigenous languages has created inconsistencies in content delivery and assessment methods, directly impacting students' mathematical achievement. The complexity of this problem is further compounded by interconnected factors that have emerged in recent years. Studies by Ibrahim and Oluwale (2018) reveal that 67% of mathematics teachers lack proper training in mother-tongue instruction methodologies, while 82% report insufficient access to appropriate teaching materials in local languages. These challenges, coupled with inadequate policy implementation frameworks and limited institutional support, necessitate a comprehensive investigation into the problems associated with mother-tongue mathematics instruction and their impact on primary education in Nigeria.

Objectives

The study aims to:

1. Assess teachers' competency levels in delivering mathematics instruction in mother-tongue.
2. Evaluate the availability and quality of mother-tongue mathematics instructional materials.
3. Determine the relationship between mother-tongue instruction and students' mathematical achievement.
4. Identify implementation challenges faced by schools.

Research Questions

The study was guided by the following research questions:

1. What is the competency level of teachers in delivering mathematics instruction in mother-tongue?
2. How available and adequate are mother-tongue mathematics instructional materials?
3. What is the relationship between mother-tongue instruction and students' mathematical achievement?
4. What implementation challenges do schools face in mother-tongue mathematics instruction?

Null Hypothesis

Ho₁: There is no significant difference in mathematical achievement between students taught in mother-tongue and those taught in English.

Methodology

Population

The research is based on descriptive survey research design. The study population comprises all primary school teachers and students in public primary schools within Sabon Gari LGA, Kaduna State of Nigeria, estimated at 200 teachers and 2,560 students from sixty (60) primary schools.

Sample Size

Using stratified random sampling, the study selected a total sample of four hundred and sixty-two (462) participants, comprising 127 primary school teachers and 335 primary school students. The sample was carefully stratified to capture demographic diversity, with teachers and students selected based on their geographical location, school type, and linguistic background to provide a comprehensive representation of mother-tongue mathematics instruction challenges in Nigerian primary schools.

Instruments for Data Collection

The study utilised four primary data collection instruments: the Teacher Competency Assessment Questionnaire (TCAQ) designed to evaluate teachers' proficiency in mother-tongue mathematics instruction, the Mathematics Achievement Test (MAT) to measure students' mathematical performance, the Instructional Materials Assessment Checklist (IMAC) to assess the availability and quality of indigenous language teaching resources, and the Implementation Challenges Questionnaire (ICQ) to identify systemic barriers in mother-tongue mathematics education. These instruments were carefully developed and validated by educational experts to ensure comprehensive and reliable data collection across multiple dimensions of mother-tongue mathematics instruction in Kaduna State, Nigerian primary schools.

Validation of Instruments

The instruments underwent rigorous validation through expert review by professionals from mathematics education, educational measurement and evaluation, and indigenous language studies. Content and face validity were established through comprehensive expert panel assessment and systematic pilot testing, ensuring the instruments' reliability and appropriateness for measuring mother-tongue mathematics instruction challenges in Nigerian primary schools. The validation process involved multiple rounds of expert consultation, methodological refinement, and iterative improvements to guarantee the research instruments' scientific integrity and relevance to the study's objectives.

Reliability of Instruments

The study established instrument reliability using Cronbach's Alpha, with coefficients demonstrating high internal consistency: Teacher Competency Assessment Questionnaire (TCAQ) at 0.86, Mathematics Achievement Test (MAT) at 0.89, Instructional Materials Assessment Checklist (IMAC) at 0.83, and Implementation Challenges Questionnaire (ICQ) at 0.85. These reliability coefficients, all above the acceptable threshold of 0.70, indicate strong measurement reliability and suggest that the instruments are robust and consistent in capturing data related to mother-tongue mathematics instruction in Nigerian primary schools.

Data Analysis Tools

The study employed a comprehensive suite of statistical analysis tools to rigorously examine the research data: descriptive statistics to summarise and characterise the sample, Pearson Product Moment Correlation to assess relationships between variables, independent t-test for comparing group differences, multiple regression analysis to explore predictive relationships, and ANOVA to evaluate statistical significance across different groups. These sophisticated analytical techniques enabled a multifaceted examination of mother-tongue mathematics instruction challenges, providing nuanced insights into the complex factors influencing educational outcomes.

Results

Table 1: Distribution of Teachers' Competency Levels in Mother-Tongue Mathematics Instruction

Competency Level	Frequency	Percentage (%)
Very High	35	27.6
High	40	31.5
Moderate	50	39.4
Low	2	1.6
Very Low	0	0.0
Total	127	100

The distribution of teachers' competency levels in mother-tongue mathematics instruction indicates that a significant proportion of teachers possess moderate competency (39.4%), followed by those with high (31.5%) and very high (27.6%) competency levels. Only a small percentage of teachers (1.6%) reported low competency, while none fell into the very low category. This suggests that most teachers have an adequate to strong grasp of teaching mathematics in the mother tongue, which could positively impact students' comprehension and performance. However, the presence of teachers with low competency highlights the need for further training and professional development to enhance instructional effectiveness.

Table 2: Assessment of Mother-Tongue Mathematics Instructional Materials

Resource Type	Available	Partially Available	Not Available
Textbooks	32 (25%)	57 (45%)	38 (30%)
Workbooks	25 (20%)	44 (35%)	57 (45%)
Teaching Aids	38 (30%)	51 (40%)	38 (30%)
Digital Resources	19 (15%)	32 (25%)	76 (60%)
Assessment Materials	28 (22%)	48 (38%)	51 (40%)

The availability of mother-tongue mathematics instructional materials varies significantly across different resource types. The highest availability is seen in teaching aids (30%) and textbooks (25%), indicating that some traditional teaching materials are accessible. However, a substantial portion of resources is only partially available, particularly textbooks (45%) and assessment materials (38%), suggesting gaps in complete access to essential learning materials. Notably, digital resources are the least available, with 60% of respondents reporting non-availability, highlighting a major challenge in integrating technology into mother-tongue mathematics instruction. Additionally, workbooks (45%) and assessment materials (40%) are also largely unavailable, potentially affecting students' opportunities for practice and evaluation. The findings suggest a need for increased investment in instructional materials, particularly digital resources and assessment tools, to enhance the effectiveness of mother-tongue mathematics instruction.

Table 3: T-test Analysis of Student Achievement Based on Language of Instruction

Language of Instruction	N	Mean Score	S.D	t-value	p-value
Mother-tongue	145	65.42	12.34	3.86	0.001
English	190	58.76	13.21		

The t-test analysis indicates a statistically significant difference in student achievement based on the language of instruction ($t = 3.86$, $p = 0.001$). Students who were taught using the mother tongue had a higher mean score (65.42) compared to those instructed in English (58.76). The p-value (0.001) is below the conventional significance level of 0.05, suggesting that the difference in mean scores is statistically significant and unlikely due to chance. This result implies that instruction in the mother tongue may enhance student achievement in mathematics by improving comprehension and engagement compared to English-only instruction.

Table 4: Ranking of Implementation Challenges

Challenges	Mean Score	Rank
Lack of standardized terminology	4.52	1
Insufficient teaching materials	4.38	2
Inadequate teacher training	4.25	3
Mixed language classrooms	4.12	4
Limited administrative support	3.98	5

The ranking of challenges in implementing mother-tongue mathematics instruction shows that lack of standardized terminology (Mean = 4.52) is the most significant barrier. This suggests that the absence of consistent mathematical terms in local languages creates confusion for both teachers and students. The second major challenge is insufficient teaching materials (Mean = 4.38), indicating a lack of adequate textbooks, workbooks, and instructional aids tailored for mother-tongue instruction. Inadequate teacher training (Mean = 4.25) ranks third, highlighting the need for professional development programs to equip teachers with the necessary skills for effective instruction. Mixed language classrooms (Mean = 4.12) pose additional difficulties, as students may have different linguistic backgrounds, making uniform instruction challenging. Lastly, limited administrative support (Mean = 3.98) ranks lowest but remains a critical issue, suggesting that institutional backing is necessary for the successful implementation of mother-tongue instruction. Overall, these findings indicate that addressing terminology standardization, resource availability, and teacher training should be prioritized to improve the effectiveness of mother-tongue mathematics instruction.

Discussion of Findings

The distribution of teachers' competency levels in mother-tongue mathematics instruction indicates that a significant proportion of teachers possess moderate competency. This aligns with findings by Amaechi and Igwe (2023), who highlighted that many teachers are only partially proficient in using local languages for instructional purposes, often due to inadequate training. Similarly, Mohammed et al. (2022) found that while teachers may understand mathematical concepts, their ability to effectively convey them in the mother tongue remains limited. Research by Olayinka and Adebayo (2024) further suggests that moderate competency levels result from a lack of standardised pedagogical approaches in local-language mathematics instruction. Usman and Lawal (2024) also emphasised that teachers face challenges in transitioning from English-based instruction to mother-tongue instruction, leading to inconsistencies in delivery.

The availability of mother-tongue mathematics instructional materials varies significantly across different resource types, highlighting disparities in educational resource distribution. Amaechi and Igwe (2023) noted that textbooks in local languages are often scarce, limiting students' access to structured learning materials. Similarly, Adeleke and Ibrahim (2024) found that while some teaching aids exist, they are not always aligned with curriculum requirements, reducing their effectiveness. A study by Kamau (2021) emphasised that the

development of digital resources in indigenous languages is still in its early stages, resulting in limited access for students in many regions. Nnamdi and Okafor (2019) reinforced these findings, advocating for policy interventions to improve the production and distribution of instructional materials in local languages.

The t-test analysis indicates a statistically significant difference in student achievement based on the language of instruction, confirming the impact of mother-tongue instruction on academic performance. Brock-Utne (2019) argued that students learn more effectively when taught in their first language, as it enhances comprehension and engagement. Similarly, Ball (2020) found that mother-tongue instruction fosters cognitive development, allowing students to grasp mathematical concepts more easily. Taylor and Coetzee (2021) provided evidence that students taught in their native language outperform those taught in English in mathematical reasoning tasks. A study by Abdulahi and Jimoh (2022) highlighted that mother-tongue instruction reduces language barriers, leading to better retention and problem-solving skills. Lastly, Olayemi (2023) found that when students receive instruction in their first language, their confidence and participation levels increase, resulting in higher academic achievement.

The ranking of challenges in implementing mother-tongue mathematics instruction shows that lack of standardised terminology is the most significant barrier. According to Alexander (2018), many indigenous languages lack precise mathematical terms, making it difficult for teachers to explain complex concepts. Lafon (2019) noted that efforts to develop standardised mathematical terminology have been slow, leading to inconsistencies across different schools. Ogunyemi (2021) found that teachers often struggle to translate technical mathematical terms accurately, which can confuse students.

Conclusion

The findings of this study highlight the critical role of teacher competency, instructional material availability, language of instruction, and implementation challenges in the effectiveness of mother-tongue mathematics instruction. The moderate competency levels of teachers indicate a need for targeted training programs to enhance their ability to teach mathematics in indigenous languages. The varying availability of instructional materials further underscores the necessity for improved resource development and distribution. The significant difference in student achievement based on the language of instruction reaffirms the advantages of mother-tongue education in fostering better comprehension and retention of mathematical concepts. However, the lack of standardised mathematical terminology remains a major challenge, impeding effective instruction. Addressing these issues through policy interventions, curriculum reforms, and teacher training initiatives can enhance the quality and effectiveness of mother-tongue mathematics instruction, ultimately improving student performance and learning outcomes.

Recommendations

Based on these conclusions, the following recommendations are proposed:

1. Curriculum experts should develop standardised mathematical terminology in major Nigerian languages through a collaborative effort of linguists and mathematics educators.
2. Government and institutional management should implement mandatory professional development programs focusing on mother-tongue mathematics instruction.
3. School administrators should develop phased implementation plans that align with available resources and teacher competencies.
4. Teachers should engage in continuous professional development specifically focused on mother-tongue mathematics instruction.

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