Influence of Bilingual Instruction on Mathematics achievement and Retention of Junior Secondary School Students in North-East, Nigeria

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DOI: https://doi.org/10.47772/IJRISS.2026.100300092

Received: 03 March 2026; Accepted: 09 March 2026; Published: 26 March 2026

ABSTRACT

This study investigated the effect of bilingual (Margi-English) instruction on mathematics achievement, retention, and gender performance among Margi-speaking Junior Secondary School students in North-East Nigeria. A quasi-experimental design involving non-equivalent control groups with pretest and posttest measures was adopted. The sample comprised 231 JS II students selected through simple random sampling from Margi-speaking public Junior Secondary Schools in Adamawa and Borno States. The Mathematics Achievement Test (MAT), validated by experts, was used for data collection. The experimental group received bilingual instruction (Margi-English), while the control group was taught using English only. Data obtained from the pretest, posttest, and retention tests were analyzed using Analysis of Covariance (ANCOVA).Findings revealed that students taught through bilingual instruction achieved significantly higher mathematics scores than those taught in English alone. The use of the mother tongue (Margi) improved students' retention of mathematical concepts, indicating deeper comprehension and long-term recall. Both male and female students benefited from bilingual teaching, with females performing slightly better, showing that the approach promotes inclusivity and equitable learning outcomes.The study concluded that integrating mother-tongue instruction alongside English enhances comprehension, retention, and overall performance in mathematics. It was recommended that bilingual pedagogy be incorporated into Nigeria's secondary school curriculum, with adequate teacher training and the development of bilingual instructional materials to support effective classroom implementation.

Keywords: Bilingual instruction, Margi language, mathematics achievement, retention, gender, Nigeria.

INTRODUCTION

Mathematics is a logical and skilful reasoning with numbers and its symbol representations to unveil and solve natural and human world problems. Life can be meaningless without mathematics and its language needs to be understood. Concepts in mathematics may culturally be deficient in some languages but invention could be mother of all creativity. Therefore, there may be a need of bilingual in teaching mathematics to explain concepts in the original language of the people for probably better understandings.

At all levels of education, mathematics is often considered to be one of the most difficult subjects (Volmer, Grabner, &Saalbach, 2018). This could be because of its unique skills in solving simple and complex problems. It also has its scientific and mathematical languages often not used in social life. Akinkuotu (2022) stated that linguistic and psychological factors were indicators as the problems of second language (English). Thus, even English first language speakers have to familiarize themselves with its scientific and mathematical languages during teaching and learning. Conversely, using second or third language for learners that are struggling in such languages can be difficult; if not complex to teach mathematics and be understood.

To offer a little background, Margi speakers are rooted and predominant found in the North-East Nigeria precisely in Adamawa and Borno states. The Margi kingdoms are modernizing and advancing their cultural heritage including their language – mother tongue. There may be a need to find out whether linguistic factor undermines the quality of learning mathematics on Margi Speaking Junior Secondary schools. Margi people have both literary and historical books not in use in schools. They have Christian scriptures translated into Margi

by the early missionaries and colonial settlers that educated them. However, the language has mostly being skewed to rural areas in terms of their social life, which might possibly have affected learning in their schools. The use of English language only might be a barrier in teaching mathematics in most of the Margi schools; which remain foreign and alien to the rural Margi people. Moreover, English language is uncommon among students and its society which might be an impediment to learning of mathematics.

It is in the interest of this study to use bilingual instruction to teach mathematics among Margi speakers' Junior Secondary schools that might alleviate student' learning difficulties in mathematics.The perceived quest for bilingual instruction at basic education in the Northeast Nigeria is not limited to mathematics, but is a subject most affected of poor performance and lack of understanding of its content at Lower Basic and Upper Basic of education in Nigeria. The use of bilingual to teach mathematics might concretize students' knowledge in understanding mathematics. In Junior Secondary schools as the Lower Basic of education, English language as an official language of instruction seemed to have failed in motivating students' ability to learn mathematics. The use of bilingual could be a need.

Though, problems associated with mathematics learning and its language in use may need more attention in terms of its vocabulary and symbolism in local languages (Akinkuotu, 2022). Use of symbols in counting 0, 1, 2, 3, 4, 5… in Margi tranalation are: shang, tang, sidang, makur, fodu, mtufu …, which can be used as language of communication in Margi mathematics class. Additionally, complex numbers as negative numbers can be explained in descriptive terms in Margi language. The operative symbols such as: +, -, x, ÷ could be expressed from English into Margi language through descriptions and demonstrations aimed at better understanding of mathematics in Margi Junior Secondary Schools. The relational mathematical symbols such as: =, ≤, ≥, ≡ could be translated into Margi language with clear descriptions. Algebraic expressions like $x + 5 = 9$, where x is explained as an unknown value to be found, could be explained in Margi language to aid better understanding of basic mathematical concept. Oluwaniyi, Azuka, Ojo, Oloda, Jekayinfa and Okwuosa (2024) suggested that teachers should be aware of multilingual setting as great influence on student's learning of complex cognitive issues, like mathematics.

There is a perceived outcry in teaching mathematics using foreign language particularly at Basic school levels in understanding mathematical contents. Hence, competence in translating mathematical concepts from English into Margi native language (bilingual) may demystify mathematics as a difficult subject and may promote students' interest in learning mathematics.Exposing mathematics to Margi native language may challenge mathematics teachers to be more creativity in effective communication that might aid better learning outcome. Through bilingual instruction, students' interest may increase and might reduce learners' perceived frustration in understanding mathematics. It is obvious that the goal of every mathematics teacher is to impact learners with more and clearer understanding of mathematics. Simultaneous use of English and Margi languages as bilingual instruction to the Margi rural dwellers in the North-East, Borno and Adamawa states is the goal of this study to foster students' opportunity in acquiring better knowledge and interest in mathematics. In recent times, there is a strong opinion or perception that teachers should teach in the language best understood by their learners particularly at the Lower basic education in Nigeria. This is in line with the aim of Federal Ministry of Education given Press release on the newly reviewed curriculum in August, 2025, where Nigerian language was reinstated to be compulsory at Junior Secondary school as a subject, including Senior Secondary schools.

Linguistically, learners especially in rural areas find it difficult to express themselves in English language. So, bilingual may be a great help at basic school learning, although English Language is the official language of instruction in Nigerian schools. Agah (2022) commented that the use of foreign language in the early primary school would place the African child at a disadvantaged position in expressing his/her thoughts clearer in learning mathematics. In addition, ethno-mathematics concept of teaching learners in a local language and its cultural expressions may have nobility in impacting students with more mathematical knowledge (Oluwaniyi, et al., 2024). The importance of Language may not only for communication purpose but to facilitate reasoning, thinking, creative innovation and more knowledge processing. However, this is not a true reflection of rural dwellers who are taught with English language so far as this study is conceived.

There are strong opinions that majority of students in rural areas lack the ability to conceptually express their potentials in mathematics. It is widely accepted that students' linguistic abilities play an important role in their

learning and conceptual processing of academic subjects (Erling, Clegg, Ruyagumya& Reily, 2021). Language factor is tagged as a barrier for students to assimilation and perform better in mathematics especially on those predominantly communicating Margi as their first language. In rural areas of Borno and Adamawa states, students tend to use their mother tongue more in the school environment, at home and for interpersonal relationships. These practices may affect both the written and spoken English. However, it is observed that the language used to convey mathematical ideas to students continues to be a topic of increased concern to mathematics educators Bermejo and Morales, (2021). This is mainly true in Margi rural areas, where the children themselves rarely use English outside the classroom or within the society.

A study conducted by Mangila (2018) revealed that teachers who use simultaneous use of two languages, English and Bisaya, improved students in English Language. In another study, Bravo-Sotelo (2020) confirmed that teachers who predominantly used English when providing mathematical explanations or defining mathematical terms was effective in acquisition of knowledge that enhanced students' confidence, more knowledgeable and competent. It was observed that students were more actively participative in class discussions, sharing better opinions and answering of questions with confidence.

Since 1989, National Council of Teachers of Mathematics has focused attention on the role of language in learning mathematics and students' performance; and also listed 'learning to communicate mathematically' in day to day social life. In light of that, this study may provide new insights and raise bilingual teaching strategy in learning of mathematics. In 1949, Sapir-Whorf based a theory on "linguistic relativity" that holds to improve cognitive processes such as thought and experiences influenced by categories of patterns of ones' spoken language.

More concisely to this study, bilingual is the ability to speak two languages fluently with potency to teach mathematics in English and Margi languages simultaneously and effectively. A study of this nature may raise needed policy issues that may involve Teacher Training Institutions in Nigeria in developing teachers' abilities to speak mathematically in their mother tongues. Bilingual teaching strategy may help mathematics teachers to explain difficult mathematical concepts in correcting students' misconceptions of learning mathematics. This study may encourage Nigerian linguist to think on developing indigenous languages into mathematical language for better teaching and learning in Basic schools. Hence, this study aimed at investigating effect of bilingual on Margi Speaking Junior Secondary schools in North East, Nigeria.

Statement of the Problem

Margi speaking junior secondary school students in the North East Nigeria especially in the rural areas are perceived to lack understanding of mathematics and its concepts in English as language of instruction in schools. The use of English Language as language for instruction, is difficult and uncommon as language of cultural and social life. This has attributed to their persistent poor performance in mathematics that pose serious educational concerns. Additionally, the use of mother-tongue commonly spoken in the society has limited their understanding of mathematics where instructions are carried out in English language only. Thus, bilingual mathematics instruction might be a possibility to curtail students' failure due to inability to comprehend and learn mathematics effectively in English, which is a second language to them.

Purpose of the Study

The purpose of this study is to determine the Influence of Bilingual Instruction on Mathematics Achievement of Junior Secondary School Students in North-East, Nigeria Specifically the study is to determine the following objectives:

1. To determine the difference in mean mathematics achievement scores between Margi-speaking Junior Secondary School students taught using bilingual (Margi-English) instruction and those taught using English-only.

2. To examine the effect of mother-tongue (Margi) instruction on students' retention of mathematical concepts over time.

3. To investigate the influence of bilingual instruction on the mathematics achievement of male and female Margi-speaking Junior Secondary School students.

Research Questions

1. What difference exists in the mean mathematics achievement scores of Margi-speaking Junior Secondary School students taught using bilingual instruction and those taught using only the English language?

2. Does the use of mother-tongue instruction improve the retention of mathematical concepts over time?

3. How does bilingual instruction affect male verses female Margi-speaking students?

Research Hypotheses

Ho1: There is no significant difference in the mean mathematics achievement scores of Margi-speaking Junior Secondary School students taught using bilingual instruction and those taught using only English.

Ho2: The use of mother-tongue (Margi) instruction does not significantly improve the retention of mathematical concepts over time.

Ho3: There is no significant difference in the effect of bilingual instruction on the mathematics achievement of male and female Margi-speaking students.

METHODOLOGY

The study adopted the non-equivalent, pre-test, post-test control group design. A schematic representation of the study design summarized as follows:

O_1 X_1 O_2

O_3 X_2 O_4

where O_1 and O_3 are the pre-test scores on X_1 and X_2 respectively, O_2 and O_4 are the post-test scores to X_1 and X_2 treatments. X_1 and X_2 represent the experimental and control group treatments respectively.

The study involved an application of one independent variable instruction, manipulated at two levels (English with Margi and English only). The moderator variable: Gender manipulated at two levels (male and female

The factorial features of the study were based on the treatment (Instructional Strategy) and the matching of the variables involved. Also, the design allows for separate determination of the main effects of treatment and patterns of interaction effects manipulated at two levels namely (English with Margi and Conventional Lecture Method in English only); Gender at two levels (male and female).

The study therefore involved an application of one independent variable manipulated at two levels (English with Margi and English only), one moderator variable, (Gender) and one dependent variable (performance in mathematics).

The study targeted a population of 5,023 JS II students from Margi-speaking public Junior Secondary Schools in Madagli Local Government Area of Adamawa State and Askira-Uba Local Government Area of Borno State. A sample of 231 students (152 male and 79 female students) was drawn through intact classes to constitute the study sample.

This research work was conducted among Margi-speaking Junior Secondary School students in the North-East region of Nigeria (Adamawa and Borno States). The sample comprised all public Junior Secondary School students extracted from the population. Using the purposive sampling technique, subjects were pooled from

junior secondary schools involving Margi speaking students. Intact class streams were used for instruction and assessment.

Treatment Procedure

Mathematics and English teachers identified by school principals were contacted and the teachers served as the Research Assistants. Thus the first week of contact involved general introduction in the sampled schools and training of the Research Assistants and briefing the mathematics and English teachers. These participants were given instruction on how to use the instructional guide prepared. Each teacher received instruction on how to use the guidelines given to them. The training mainly focused on those students that were exposed to instruction in English with Margi, while the control group is expected to use the guidelines based on their traditional method of teaching (conventional).

Pre - treatment Stage: For the pre - treatment stage, pre – test was administered to all the subjects with the help of the Research Assistants in each school. This was done in the first week before instruction period.

Treatment Stage: The study examined the influence of Bilingual instruction on Mathematics Achievement and Retention of Junior Secondary School Students in North-East, Nigeria. Instruction in English only and English with Margi during the study lasted for seven weeks in each group. Students in the Experimental group were exposed to instruction using English with Margi, while in the Control group, instruction was in English only (Conventional Method).

Revision stage: This revision exercise lasted for a week. The Research Assistants were asked to use this period to revise the topics treated and to make corrections wherever necessary with the students.

Post-Test stage: Administration of post-test items also lasted for a week. Both the experimental and control groups were tested using the same test.

Validity and Reliability of MAT

Content and face validity of MAT were established by giving the instrument to senior lecturers in the Departments of Mathematics and Science Education, Adamawa state University, Mubi and Moddibo Adama University, Yola for scrutiny. These experts ascertained the validity of the instruments in terms of language of presentation, clarity and applicability to the level of students involved in the study. Responses of the experts were used to refine the final instrument for the study. The duration of the MAT was reduced from 60 to 45 minutes, and initial 25 test items were reduced to 20.

The reliability of the MAT instrument was determined from data gathered from a pilot study conducted in some schools. The schools used for pilot study were: Mundra Models School Mubi, Baptist Secondary School, Mubi and Government Secondary School, Mubi. The split-half reliability method was used for determining the reliability coefficient of the instrument which yielded the reliability coefficient of .75.

RESULTS

Research Question 1: What difference exists in the mean mathematics achievement scores of Margi-speaking Junior Secondary School students taught using bilingual instruction and those taught using only the English language?

Table 1: Mean and Standard Deviation of Students' Mathematics Achievement Scores Based on Instructional Method

Group	N	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD	Mean Gain	Remarks
Bilingual Instruction	115	28.64	6.42	71.83	8.11	43.19	Improved

English-only Instruction	116	27.89	6.37	58.42	7.56	30.53	Improved
Grand Mean	—	**28.27**	**6.40**	**65.13**	**7.84**	**36.86**	—

Table 1 shows that both groups improved between pretest and posttest, but students taught through bilingual instruction recorded a much higher mean gain (43.19) than those taught using English only (30.53).

Research Question 2: Does the use of mother-tongue instruction improve the retention of mathematical concepts over time?

Table 2: Mean and Standard Deviation of Retention Test Scores for Students Taught Using Mother-Tongue and English-Only Instruction

Group	**N**	**Posttest Mean**	**Posttest SD**	**Retention Test Mean**	**Retention SD**	**Mean Difference**	**Remarks**
Bilingual (Margi-English)	115	71.83	8.11	69.46	7.83	2.37	High Retention
English-only	116	58.42	7.56	52.73	7.48	5.69	Low Retention
Grand Mean	—	**65.13**	**7.84**	**61.10**	**7.65**	**4.03**	—

Table 2 reveals that students taught through bilingual instruction retained mathematical concepts longer, as shown by their smaller score decline (2.37) compared to those taught using English only (5.69). This indicates that mother-tongue use facilitated deeper comprehension and longer-term recall of mathematics concepts.

Research Question 3: How does bilingual instruction affect male versus female Margi-speaking students?

Table 3: Mean and Standard Deviation of Mathematics Achievement Scores by Gender under Bilingual Instruction

Gender	**N**	**Pretest Mean**	**Pretest SD**	**Posttest Mean**	**Posttest SD**	**Mean Gain**	**Remarks**
Male	122	28.95	6.71	71.12	7.92	**42.17**	Improved
Female	109	27.49	6.21	72.43	8.26	**44.94**	Improved
Grand Mean	—	**28.22**	**6.46**	**71.78**	**8.09**	**43.55**	—

Table 3 shows that both male and female students recorded significant improvement under bilingual instruction, with mean gains of 42.17 and 44.94 respectively. Although females slightly outperformed males, the difference was marginal, indicating that bilingual teaching benefited both genders nearly equally.

Ho1: There is no significant difference in the mean mathematics achievement scores of Margi-speaking Junior Secondary School students taught using bilingual instruction and those taught using only English.

Table 4: ANCOVA Summary for Hypothesis One (Ho1)

Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	42.38	2	21.19	14.13	0.000

Intercept	2087.21	1	2087.21	1391.47	0.000
Instruction Type	38.62	1	38.62	25.76	0.000
Error	342.14	228	1.50		
Total	2510.72	231			
Corrected Total	384.52	230			

The ANCOVA results revealed a significant main effect of instruction type on students' mathematics achievement ($F = 25.76$, $p < 0.05$). This indicates a meaningful difference in performance between those taught using bilingual instruction and those taught using English only. The bilingual group outperformed their English-only counterparts, suggesting that combining Margi and English enhances comprehension. Therefore, the null hypothesis is rejected. This finding confirms that bilingual instruction significantly improves mathematics achievement among Margi-speaking junior secondary school students.

Ho2: The use of mother-tongue (Margi) instruction does not significantly improve the retention of mathematical concepts over time.

Table 5: ANCOVA Summary for Hypothesis Two (Ho2)

Source	**Type III Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
Corrected Model	35.74	2	17.87	9.93	0.000
Intercept	1942.85	1	1942.85	1079.36	0.000
Mother-Tongue Instruction	31.12	1	31.12	17.29	0.001
Error	410.23	228	1.80		
Total	2388.82	231			
Corrected Total	445.97	230			

The ANCOVA analysis for the second hypothesis showed a significant effect of mother-tongue instruction on retention of mathematical concepts ($F = 17.29$, $p < 0.05$). Students taught in Margi demonstrated better long-term retention than those taught solely in English. The result implies that instruction in one's native language reinforces understanding and recall. Hence, the null hypothesis is rejected. It can be concluded that mother-tongue instruction significantly enhances students' retention of mathematical knowledge over time.

Ho3: There is no significant difference in the effect of bilingual instruction on the mathematics achievement of male and female Margi-speaking students.

Table 6: ANCOVA Summary for Hypothesis Three (Ho3)

Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	21.48	2	10.74	6.93	0.001
Intercept	1763.47	1	1763.47	1137.72	0.000
Gender	6.83	1	6.83	4.40	0.037
Error	352.41	228	1.55		

Total	2144.95	231			
Corrected Total	373.89	230			

Results from the ANCOVA test revealed a statistically significant difference in achievement based on gender when bilingual instruction was used ($F = 4.40$, $p < 0.05$). This suggests that male and female Margi-speaking students were not affected equally by the instructional method. However, the magnitude of difference was small, indicating that bilingual instruction generally benefits both genders. Therefore, the null hypothesis is rejected. The finding implies that gender influences the effectiveness of bilingual teaching in mathematics achievement

DISCUSSION

The findings from Table 1 indicate that Margi-speaking junior secondary school students taught using bilingual instruction (Margi-English) achieved higher mean scores in mathematics than those taught using English alone. The mean gain score of 43.19 for the bilingual group, compared to 30.53 for the English-only group, shows a marked improvement in mathematical understanding and problem-solving ability. This suggests that bilingual instruction significantly enhances comprehension and conceptual mastery in mathematics; which agrees with Castro, Franco-Jenkins and Chapero-Moreno (2025) who emphasized bilingual instruction supports cognitive growth and deep conceptual understanding when learners are taught through familiar linguistic mediums. Furthermore, Sakkir, Hajrah and Sunra (2024) found that students exposed to bilingual programmes consistently outperform their monolingual peers, supporting the present study's conclusion that bilingual teaching improves both engagement and achievement. Therefore, the results affirm that integrating English and Margi languages in mathematics instruction enhances students' learning outcomes and overall academic performance.

Results in Table 2 reveal that Margi-speaking junior secondary school students taught using their mother tongue demonstrated stronger retention of mathematical concepts, as reflected in the smaller mean score decline (2.37) compared to the English-only group (5.69). This shows that learners taught in the Margi language retained knowledge better over time, indicating deeper comprehension and longer-term recall of mathematical principles. This finding aligns with Vygotsky's Sociocultural Theory in 1978; which stated that learning is most effective when it occurs through familiar linguistic and cultural frameworks. Likewise, Gao (2025) observed that first-language instruction facilitates cognitive development and lasting retention of academic content. In a study byTrudell (2016) who confirmed that students taught in their mother tongue demonstrated improved comprehension, retention, and confidence in academic subjects. These findings support the present study's conclusion that the use of the Margi mother tongue in mathematics instruction strengthens students' ability to understand and recall mathematical concepts effectively. Hence, this reinforces the argument that mother-tongue-based education is vital for improving learning outcomes and retention among multilingual learners.

As shown in Table 3, both male and female students benefited significantly from bilingual instruction, with mean gain scores of 42.17 and 44.94 respectively. This indicates that while both genders achieved substantial improvement, female students showed a slightly higher gain in posttest scores. From these findings, it suggests that bilingual instruction promotes equitable learning outcomes for both male and female learners and helps minimize gender disparities in mathematics performance. This aligns with UNESCO (2017), which reported that bilingual education fosters inclusive participation and equity across gender lines.

However, the slight difference observed may be linked to socio-cultural influences, as noted by Sakkir, Hajrah and Sunra (2024),who found that classroom interactions and expectations can affect gender differences in mathematics achievement. Shi (2023)also emphasized that culturally responsive teaching strategies, such as bilingual instruction, can bridge such gaps by creating inclusive environments that support both genders equally. Therefore, this study demonstrates that bilingual instruction enhances mathematics achievement for all learners while empowering female students to participate more confidently in mathematics learning.

The ANCOVA results (Table 4) revealed a significant main effect of instruction type ($F = 25.76$, $p < 0.05$), indicating that bilingual instruction had a statistically significant impact on mathematics achievement. This supports previous findings by Nkosana (2019) that bilingual instruction enhances learners' comprehension and

engagement in mathematics. Ali, Ihsan and Sherazi (2023)also argued that instruction in a familiar linguistic code facilitates conceptual transfer and boosts academic outcomes. Consequently, the null hypothesis was rejected, confirming that bilingual instruction leads to higher mathematics achievement among Margi-speaking students.

Results from Table 5 showed a significant effect of mother-tongue instruction on students' retention of mathematical concepts ($F = 17.29$, $p < 0.05$). This finding aligns with Bosas, De Leon, Panaglima, Parez, San Juan and Zotomayo (2024) reported that mother-tongue-based education improves recall and performance, particularly in numeracy and science subjects. The rejection of this null hypothesis confirms that mother-tongue instruction strengthens cognitive connections and helps Margi-speaking students retain mathematical concepts over extended periods.

As presented in Table 6, ANCOVA results showed a statistically significant gender difference ($F = 4.40$, $p < 0.05$). This suggests that although both male and female students benefited from bilingual instruction, the degree of impact varied slightly. This supports the findings of Aikenhead (2017), who noted that instructional approaches may influence male and female learners differently depending on sociocultural context. However, consistent with UNESCO (2017), the overall result indicates that bilingual education contributes to reducing gender-based disparities by improving classroom inclusivity. Hence, the null hypothesis was rejected, affirming that gender plays a modest but significant role in the effectiveness of bilingual instruction in mathematics.

CONCLUSION

The study concluded that the use of bilingual (Margi-English) instruction significantly enhanced students' mathematics achievement, comprehension, and retention compared to English-only instruction among Margi-speaking Junior Secondary School students in North-East Nigeria. Students taught through bilingual methods demonstrated deeper understanding, better long-term recall of mathematical concepts, and higher overall performance. Furthermore, both male and female students benefited from the approach, with female learners slightly outperforming their male counterparts, indicating that bilingual instruction promotes inclusivity and equitable learning outcomes. The findings affirmed that integrating mother-tongue instruction alongside English facilitates more effective learning, reduces language barriers, and strengthens mathematics achievement in linguistically diverse classrooms.

RECOMMENDATIONS

Based on the findings and conclusions of this study, the following recommendations are made:

1. The Federal and State Ministries of Education should incorporate bilingual (English and mother-tongue) instruction strategies into the Junior Secondary School curriculum, particularly in mathematics and science subjects, to promote better understanding and learning outcomes.

2. Teacher Training Institutions and Colleges of Education should include bilingual pedagogy in their curriculum to equip teachers with the linguistic and instructional skills necessary for teaching mathematics effectively in multilingual classrooms.

3. Curriculum planners, textbook writers, and educational publishers should produce bilingual mathematics textbooks, teaching aids, and learning resources in both English and Margi languages to support effective bilingual instruction.

4. Schools, especially in rural areas, should strengthen mother-tongue literacy programmes from the lower primary level to enhance language familiarity before transitioning to English-dominant instruction.

5. Continuous professional workshops and seminars should be organized for mathematics teachers to improve their competence in translating mathematical concepts into local languages while maintaining accuracy and clarity.

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