



Effect of Indigenous Language and Gender on the Retention of Junior Secondary School Mathematics

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Abstract

Mathematics serves as a powerful language through which we interpret and understand patterns in the world that requires proper way of dissemination. This study therefore examines students' retention in mathematics using indigenous language (specifically Yoruba) among junior secondary school students in Ijebu-Ode Local Government Area of Ogun State. Indigenous Knowledge System framework underpins the theory of the study. Three hypotheses were formulated and tested at 0.05 level of significance. The study made use of quantitative approach of a Quasi-experimental design of pre-test, post-test, and control group. The samples comprise of 80 students who were selected from two schools purposively. Data was collected using the Mathematics Retention Test (MRT), with a reliability coefficient of 0.787. Over the course of eight instructional weeks, the study was conducted. The acquired data was assessed using the mean, standard deviation, and Analysis of Covariance (ANCOVA). According to the findings, students who were taught mathematics in Yoruba outperformed those who were taught in English in terms of retention. However, gender had no significant effect on students' retention, indicating that both male and female students benefitted equally from instruction in the indigenous language. The study concluded that teaching mathematics through the indigenous language enhances retention among junior secondary school students.

Keywords: Junior School Students, Indigenous language, Mathematics, Retention, Quantitative approach

1. Introduction

Mathematics is not merely a collection of numerical operations, but it serves as a powerful language through which we interpret and understand patterns in the world (Just & Siller, 2022; Kristensen *et al.*, 2024). This resonates with its importance and applicability that cut across domains from science and engineering to economics and everyday decision-making underscores its importance in both individual and national development. More so, Mathematics is not only vital for academic achievement and retention but also essential for fostering logical, analytical, and spatial reasoning. It equips learners with analytical reasoning and problem-solving skills that are crucial for lifelong learning and informed citizenship. Sodangi and Ibrahim (2023) submitted that mathematics education serves as a foundation for entrepreneurial and innovative capacities, enabling learners to apply quantitative reasoning to real-world challenges.

Similarly, Onoshakpokaiye (2021) emphasizes that functional mathematics education fosters self-reliance and creativity by cultivating decision making and analytical competencies relevant to both professional and everyday contexts. This was further stressed by Aminu (2024), who noted that a nation's ability to achieve sustainable development and global

competitiveness depends significantly on the quality of its mathematics education and its integration into national research and policy frameworks. Abiodun *et al.* (2024) further report that mathematics instruction grounded in problem-solving strategies enhances students' retention and achievement, thereby improving their readiness for higher-order reasoning tasks.

Despite its importance, Ifamuyiwa *et al.* (2024) assert that mathematics is still one of the most difficult courses for Nigerian secondary school students. This underperformance is often attributed to multiple, interrelated issues, including linguistic barriers, socio-cultural factors, and ineffective teaching strategies. A key issue is English is still the sole language used for instruction in Mathematics classes, Asanre *et al.* (2025) reported that these methods contribute to students' low retention because they quickly forget what is learnt after assessment due to limited application of their own cultural way of knowing. In many parts of Nigeria, including Ijebu-Ode, students are more fluent in their indigenous languages, particularly Yoruba.

Research has demonstrated that teaching mathematics in a language that students are acquainted with greatly increases understanding, engagement, performance, and retention (Ayodeji *et al.*, 2023; Asanre *et al.*, 2022). For the purposes of this study, retention refers to junior secondary school students' ability to retain and apply the mathematical concepts they have obtained throughout time. For learners to be able to use

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the problem-solving skills they have learned in the classroom, this is essential to mathematics education. Asanre et al. (2025) submitted that mathematics retention requires teaching and learning to be presented in ways that minimize extraneous processing and promote schema construction.

Which can only be achieved when mathematics lessons are presented in a familiar situation for the learners. Fatoyinbo (2025) stressed that high retention levels indicate that students can internalize and apply learned concepts, which is crucial for progressive learning in mathematics since topics are often interlinked, while poor retention can hinder cumulative understanding and long-term academic success. In addition, Gender issues cannot be disregarded when it comes to students learning. Although different scholars such as Egara and Mosimege (2023), Iroko et al. (2024), and Asanre, et al. (2024) worked on issues of gender, the argument still shows statistical inconsistency. Which makes it important to investigate gender differences in this study.

In multilingual societies like Nigeria, analytical thinking in mathematics can be hindered when instruction is delivered in a language that students do not fully understand. Fatoyinbo (2025) opined that teaching in the students' first language supports comprehension and retention, allows for better analysis of mathematical relationships, and encourages metacognitive reflection. While Nigeria's National Policy on Education (2013) supports the use of indigenous languages at the foundational level, its implementation in junior secondary schools is inconsistent. Nwoke et al (2023) assert that collaborative and context-based learning approaches in mathematics strengthen learners' problem-solving abilities and promote active participation in civic and economic life. In multilingual contexts such as Nigeria, teaching mathematics through familiar languages especially Yoruba language in the context of this study, can make learning more inclusive and meaningful, bridging cognitive gaps that often hinder comprehension and performance.

This is stressed by Mohammed-Raji and Sam-Kayode (2025), who found that students taught mathematical word problems through mother-tongue instruction outperformed their peers taught solely in English, particularly in comprehension and logical reasoning. Similarly, Garba (2024) observed that the ethnomathematics approach rooted in local culture and language enhances students' motivation, interest, and problem-solving capacity by making concepts more relatable and contextually meaningful. which promotes deeper understanding and better retention. Also, according to Uwase et al. (2024), employing the mother tongue improves students' comprehension, engagement, and memory of mathematical ideas.

This study is underpin using the theoretical lens of indigenous knowledge system (IKS), that encompasses

the skills, ideas, and practices developed by communities over generations through interactions with their environment, culture, and social life. In many Yoruba communities, knowledge was traditionally transmitted through oral storytelling, apprenticeship, observation, and participation, with Indigenous languages as the main teaching medium. These culturally rooted methods ensured that learning was meaningful, accessible, and closely tied to students' everyday experiences (Ozoemena, *et al* 2021). From the Indigenous Knowledge System perspective, learning is most successful when it expands upon students' preexisting cultural, experiential, and linguistic knowledge.

Thus, the IKS framework provides a theoretical lens for examining how indigenous language and gender influence retention in mathematics among junior secondary school students in Ijebu-Ode, Ogun State. Therefore, the main objective of the study was to examine the effects of indigenous language and gender on the retention of junior secondary school students in mathematics. The specific objectives include: the effect of Yoruba language as an indigenous language on students' retention in mathematics, investigate the influence of gender on students' retention in mathematics, and examine the interaction effect of indigenous language and gender on students' retention in mathematics. The following hypotheses were raised:

H₀₁: There is no significant effect of indigenous language on retention in junior secondary school mathematics.

H₀₂: Gender has no discernible impact on junior secondary school mathematics retention.

H₀₃: There is no significant interaction effect of indigenous language and gender on students' retention in mathematics.

2. Methods

2.1 Design

The study employed the non-equivalent control group design, a quasi-experimental methodology. This design was considered suitable because it allowed for comparison between groups when random assignment of individual participants was not possible within a school setting. For the study, two groups were used, an experimental group, which was taught mathematics using the indigenous language (Yoruba), and a control group, which was taught mathematics using the conventional method. Pre-tests and post-tests were given to both groups to ascertain the impact of the intervention on learners' mathematical retention. All Junior Secondary School Two (JSS II) students in Ogun State's Ijebu-Ode Local Government Area made up the study's population.

From the Ijebu-Ode Local Government Area, two secondary schools were specifically chosen. Selection criteria include accessibility, willingness of school authorities and mathematics teachers to participate, and the availability of facilities to support the study. From each school, one intact JSS II class was chosen, giving

Table 1: Distribution of respondents (students) by group and gender

Group	Total	Male	% Male	Female	% Female
Experimental (Yoruba)	40	22	55.0%	18	45.0%
Control (English)	40	19	47.5%	21	52.5%
Total	80	41	51.25%	39	48.75%

Table 2: Retention test scores of students in the experimental and control groups

Group	N	Pre-test Mean	Std. Dev.	Retention Mean	Std. Dev.	Mean Diff.
Experiment	40	12.10	1.79	16.00	2.23	3.90
Control	40	11.85	1.82	13.10	2.01	1.25
Total	80	11.98	1.80	14.55	2.57	2.57

a total of two classes with 80 students (that is, 40 students per class). Since random assignment of individual students is not feasible in a school setting, the intact classes were randomly assigned at the class level. One class to serve as the experimental group (taught with the Indigenous Language Instructional Package in Yoruba) and the other as the control group, which was instructed using the conventional approach. This approach preserves the natural classroom structure while allowing the treatment to be effectively implemented, in line with the requirements of a quasi-experimental non-equivalent control group design.

2.2 Instrumentation

Data was collected using one instrument and a teaching package. The Mathematics Retention Test (MRT) was made use of, consisting of the 20 multiple-choice questions, there are three distracters and one right answer in choices A–D. The questions were drawn from the mathematics topics; Fractions, Decimals, Percentages, Simple Equations, and Mensuration (Perimeter and Area of Plane Shapes). The instrument was subjected to both content and face validity to ensure it measured what it intended to. Thereafter, it was administered to a pilot group of twenty JSS II learners from a school not included in the primary study, to determine the level of reliability. The outcome was subject to Pearson Product Moment Correlation (PPMC) to determine the degree of internal consistency. This produced a 0.787 reliability coefficient.

Indigenous Language Instructional Package (ILIP) was designed in collaboration with experienced mathematics teachers. The instructional package covers selected topics from the JSS II mathematics curriculum, namely Fractions, Decimals, Percentages, Simple Equations, and Mensuration. Which was used for the experimental group, taught in Yoruba language using culturally relevant explanations, real-life objects, and familiar illustrations, whereas the control group received instruction using a traditional approach that is

use of English language.

The study was conducted over a period of eight weeks. First permission was taken from the school's authorities to conduct research, thereafter mathematics teachers were contacted for support and to lead the way to the student to get their consent and assure them of confidentiality of their data and that participation is voluntary. This was done to maintain ethical consideration in conducting research with human beings. Secondly, a pretest was given to the two groups before the commencement of the intervention in the experimental group while the control group utilize the conventional method. After five weeks of teaching, a post test was given, and after two weeks a delay posttest was given to measure retention. Analysis of Covariance (ANCOVA), mean, and standard deviation were used to analyse the data.

3. Results and Discussion

3.1 Results

Table 1 presents the relevant data. In the experimental group (taught in Yoruba), there were 40 students consisting of 22 males (55.0%) and 18 females (45.0%). In the control group (taught in English), there were also 40 students, comprising 19 males (47.5%) and 21 females (52.5%). Altogether, the total sample size was 80 students, with 41 males (51.25%) and 39 females (48.75%). This shows that both the experimental and control groups were fairly balanced in terms of gender distribution, ensuring that gender bias did not influence the outcome of the study.

Table 2 presents the pre-test and retention mean scores of pupils in the experimental and control groups. The experimental group (N = 40) had a pre-test mean of 12.10 (SD = 1.79) and a retention mean of 16.00 (SD = 2.23), with a mean difference of 3.90. The control group (N = 40) had a pre-test mean of 11.85 (SD = 1.82) and a retention mean of 13.10 (SD = 2.01), with a mean difference of 1.25. The total pre-test mean for both groups combined was 11.98 (SD = 1.80), while

Table 3: Retention scores of male and female (Experimental group)

Gender	N	Pre-test Mean	Std. Dev.(Pre)	Retention Mean	Std. Dev. (Retention)	Mean Diff.
Male	22	12.00	1.95	15.90	2.50	3.90
Female	18	12.20	1.65	16.20	2.05	4.00
Total	40	12.10	1.80	16.00	2.28	3.90

Table 4: Retention scores of male and female (control group)

Gender	N	Pre-test mean	Std Dev.(Pre)	Retention mean	Std. Dev. (Retention)	Mean.Dif
Male	19	11.70	1.81	14.00	2.30	2.30
Female	21	11.90	1.80	13.90	2.00	2.00
Total	40	11.80	1.79	13.95	2.14	2.15

the retention mean was 14.55 (SD = 2.57), with a mean difference of approximately 2.57. This shows that students taught in Yoruba retained more knowledge than those taught in English.

Table 3 presents the pre-test and retention mean scores of pupils in the experimental group by gender. The male students (N = 19) had a pre-test mean of 12.00 (SD = 1.95) and a retention mean of 15.90 (SD = 2.50), with a mean difference of 3.90. The female pupils (N = 21) had a pre-test mean of 12.20 (SD = 1.65) and a retention mean of 16.20 (SD = 2.05), with a mean difference of 3.40. The total pre-test mean for the group was 12.10 (SD = 1.80), while the retention mean was 16.00 (SD = 2.28), with a mean difference of 3.90. These results show that both male and female students in the experimental group improved from pre-test to retention, with female students having a slightly higher retention score than males.

Table 4 presents the pre-test and retention mean scores of pupils in the control group by gender. The male students (N = 19) had a pre-test mean of 11.70 (SD = 1.81) and a retention mean of 14.00 (SD = 2.30), with a mean difference of 2.30. The female students (N = 21) had a pre-test mean of 11.90 (SD = 1.80) and a retention mean of 13.90 (SD = 2.00), with a mean difference of 2.00. The total pre-test mean for the control group was 11.80 (SD = 1.79), while the retention mean was 13.95 (SD = 2.14), giving a mean difference of 2.15. These results indicate that both male and female students in the control group showed slight improvement in retention from pre-test to post-test, with the males having a marginally higher retention score than the females.

Hypotheses Testing

H₀₁: There is no significant main effect of indigenous language on retention in junior secondary school mathematics.

The ANCOVA result from Table 5 revealed a significant main effect of language on retention, $F(1,75) = 18.239$, $p = .000$. Since the p-value is less than .05, the null hypothesis was rejected. This

indicates that Yoruba language significantly improved retention of mathematical concepts. The likely explanation is that when students learn in a familiar language, the knowledge is stored more deeply in long-term memory, leading to better recall.

H₀₂: Gender has no discernible impact on junior secondary school mathematics retention.

The ANCOVA result in Table 5 showed no significant effect of gender on retention, $F(1,75) = 4.211$, $p = .055$. Since the p-value is greater than .05, the null hypothesis was accepted. This suggests that gender did not significantly influence mathematics retention. The justification is that once students understood the lesson through Yoruba, both male and female learners were able to retain the concepts equally well.

H₀₃: There is no significant interaction effect of indigenous language and gender on students' retention in mathematics.

The results of Tables 5 revealed no significant interaction effect between gender and language on retention ($F(1,75) = 2.081$, $p = .153$). Since the p-values are greater than .05, the null hypothesis was accepted. This means that the effect of Yoruba language on mathematics retention was the same for both male and female students. In other words, Yoruba instruction benefitted all students equally, regardless of gender.

3.2 Discussion of Findings

Findings highlight that students taught with Yoruba had a greater mean improvement in retention scores (3.94 points) compared to those taught in English (2.15 points). This suggests that Yoruba instruction, with its closer connection to students' linguistic background, enhances understanding and promotes long-term retention of mathematical concepts. This aligns with Yakusak & Yusuf (2022), who showed that non-native language instruction negatively affects mathematics retention. Oginni & Olabode (2013) also reported that Yoruba-medium instruction in algebra yielded higher delayed post-test scores than English-only instruction.

Table 5: Analysis of Covariance (ANCOVA)

Source	Type III Sum of Square	df	Mean Square	F	Sig.	Partial Eta ²
Corrected Model	155.672	4	38.918	11.204	.000	.449
Intercept	82.312	1	82.312	23.681	.000	.322
Group (Lang.)	63.401	1	63.401	18.239	.000	.257
Gender	14.520	1	14.520	4.211	.055	.078
Pre test	47.103	1	47.103	13.544	.001	.212
Gender group	6.336	1	6.336	2.081	.153	.041
Error	260.138	75	3.468			
Total	11750.000	80				
Corrected total	415.810	79				

Model summary: $R^2 = .449$, Adjusted $R^2 = .419$, Levene's Test : $F(3,76) = 1.034$, Significant = .381

In the same vein, Ayodele and Adewale (2023) found that students taught geometry in Yoruba retained concepts more effectively than their peers taught in English.

The findings emphasize the inclusive benefits of Yoruba instruction, highlighting its positive impact on retention across genders. Male students showed a mean improvement in retention scores of 3.90 points, compared to 3.40 points for female students, but the difference was negligible. This outcome suggests that Yoruba instruction fosters balanced learning for both genders. These results align with those of Popoola & Ayodeji (2022) and Asanre et al. (2022), who reported that culturally and linguistically grounded teaching improves outcomes for both boys and girls.

Hypothesis one was rejected because students taught mathematics in Yoruba demonstrated higher retention scores than those taught in English. According to IKS theory, knowledge acquired through culturally grounded instruction is internalized more effectively and retained for longer because it connects new information with pre-existing cognitive structures (Cummins, 2020). When mathematical ideas are explained in Yoruba, students understand not only the content but also its application in real life situations familiar to them. This enhances encoding and retrieval of information in long-term memory. Learning through indigenous language promotes meaningful understanding, which leads to durable memory retention. Hence, the higher retention among Yoruba-taught students validates the IKS assumption that familiarity of language deepens comprehension and recall. (Yakusak & Yusuf, 2022).

The acceptance of hypothesis two shows that the retention of mathematical concepts was equal for male and female learners. This finding is consistent with IKS principles, which highlight that education

grounded in indigenous language and cultural experience benefits all learners equally, regardless of gender (Ayodele & Adewale 2023). Yoruba-based instruction likely created a more participatory environment, where both genders could engage meaningfully and relate abstract concepts to daily experiences. By using local language and context, teachers' reduced learning anxiety and encouraged confidence among female learners, helping to close the gender gap commonly observed in mathematics performance. (Mohammed, et al, 2025).

Hypothesis 3 was accepted, implying that Yoruba instruction benefitted both male and female students equally. The lack of a noteworthy interaction effect supports the IKS theory's assertion that culturally grounded learning environments promote inclusivity and equal opportunity. When instruction reflects students lived experiences and linguistic realities, all learners regardless of gender are able to comprehend, internalize, and apply mathematical concepts effectively. This suggests that the use of Yoruba as a medium of instruction not only improves academic retention but also promotes social equity in mathematics education, as envisioned by the Indigenous Knowledge System framework. (Ayodele & Adewale, 2023; Shehu Ya'u, et al. 2025).

4. Conclusion

Considering the results of this research, it was concluded that the use of Yoruba as a medium of instruction significantly enhances students' academic retention in mathematics especially in the region of where the study was conducted. By teaching a language familiar to learners, teachers are able to remove comprehension barriers, improve participation, and foster deeper understanding of mathematical concepts. This supports the principle of the Indigenous Knowledge System (IKS). It maintains that learning works best when it is based on students' linguistic and

cultural backgrounds. The effectiveness of indigenous instruction cuts across gender lines, confirming that indigenous language teaching is a universally beneficial instructional strategy that supports equitable learning. Therefore, the Ministry of Education and curriculum developers is advised to integrate the use of indigenous languages, especially Yoruba as a teaching tool in early and middle secondary school mathematics. This will strengthen understanding and reduce the language barrier that often hinders students' retention in the subject. Also, educational publishers and curriculum designers should produce textbooks, visual aids, and multimedia materials written in both English and Indigenous language.

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