ZAJES | ZARIA JOURNAL OF EDUCATIONAL STUDIES 23(2), DECEMBER 2023
ISSN: Journal homepage: www.zarjes.com

Effect of Mother Tongue Instructional Strategy on Basic Science Students' Performance in Upper Basic Schools in Ilorin Metropolis, Kwara State, Nigeria

[1]Aiyedun, E. O. (Ph.D), [2]Ogundairo, David A. (M.Ed), [3]Ajibola, A. S. T. (M.Ed)

[1]Department of Fine and Applied Arts,
Kogi State College of Education (Technical), Kabba, Nigeria.
Email: emmanuel_olugbenga@yahoo.com

[2]Department of Educational Technology,
University of Ilorin, Ilorin Nigeria
Email: davidogundairo@gmail.com

3Department of Statistics,
Kabba College of Agriculture,
Ahmadu Bello University, Kabba, Nigeria,
Silas90@gmail.com

Abstract

The aim of this research was to evaluate the effect of a mother-tongue instructional strategy on upper basic students' performance in Basic Science within Ilorin Metropolis, Kwara State, while also examining the moderating influence of gender. Specifically, the objectives of the study were to: (i) examine the differences in mean achievement between students in upper basic classes taught Basic Science in Yoruba and those taught in English; (ii) determine the mean achievement and the impact of gender on the performance of male and female upper basic students taught Basic Science in Yoruba. A pre-test/post-test control group quasi-experimental design was employed in the study. Three public junior secondary schools were randomly selected from Ilorin Metropolis. An intact class of JSS 3 students was chosen from each school, yielding a total of 181 students. The data collection instruments included the Mother Tongue Basic Science Achievement Test (α = .79), complemented by instruction guides. Analysis of the collected data was performed using analysis of covariance at a .05 significance level. Females comprised 51.4% of the participants. Significant differences in achievement were observed between students taught using the mother tongue strategy and those taught using conventional strategies in Basic Science, both in literacy and numeracy skills ($F(2, 232) = 28.95$; $p < .05$, partial $\eta 2 = .233$). Students exposed to the mother tongue strategy scored the highest on the Basic Science Achievement Test (mean score = 69.45). The mother tongue strategy proved effective in enhancing students' performance and achievement in Basic Science in Ilorin Metropolis, regardless of gender. The study concluded that students achieved better academic results in Basic Science when instructed in their mother tongue. Consequently, it is recommended that teachers consider adopting this strategy to improve student performance in Basic Science

Article History
Received: September 2023
Review processes
October- November 2023
Received in revised form:
November 2023
Accepted: December 2023
Published online: December 2023

KEYWORDS
- Mother Tongue
- Instructional Strategy
- Basic Science Schools
- Ilorin, Kwara State

Introduction

Language stands as a pivotal medium for communication across all human echelons. Besides serving as an instrumental conduit for cultural transmission across generations, it also serves as a tool for instruction (Kramsch, 2014). As Flores and Rosa (2015) highlighted, language transfers thoughts, concepts, and knowledge between individuals in oral or written formats. The

primary language spoken by a child's parents is often referred to by various terms such as the child's mother tongue, first language (L1), or vernacular.

Joga (2013) emphasizes the pivotal role of the mother tongue in a child's education. From serving as a medium of expression and communication to shaping societal groups, it facilitates learning and intellectual development, among the numerous applications of the mother tongue in educational settings. Consequently, it necessitates a significant positioning of the mother tongue within the school curriculum. This might elucidate why many countries, including Arab Nations, India, Russia, and Japan, have made substantial scientific and technological progress by leveraging their mother tongues as catalysts.

The discipline of science is inherently a means to solve problems and the process designed to enhance the quality of human existence. As Kobori et al. (2016) postulated, science is a human intellectual activity aimed at unveiling information about the natural world and identifying its potential for human advantage. Scholars such as Poincare (2022) view science as an organized body of knowledge, epitomizing human efforts to interpret worldly phenomena and their utility for the human race. Kiyici and Kiyici (2007) see science as an advanced human endeavour, creating a body of universal declarations that elucidate the observable operations within the universe or a portion of it. Considering these viewpoints, science manifests as an exploratory field or an organized examination of observable events subject to testing and verification.

Science, as characterized by these definitions, is not purely a process of acquiring facts. Instead, it involves students' active participation through various activity-based methods such as demonstrations, discussions, projects, field trips, and discovery methods. Coupled with effective language for communication, these teaching techniques make science learning more meaningful. The National Policy on Education highlights that it enables students to unravel concepts independently (FME, 2004). Hence, it is paramount to stimulate students' interest in science at the upper basic level through instruction in a language they fully understand. This fosters a deeper comprehension of the subject matter, equipping students to further explore science at the secondary level. Hermann (2005) posits that the success of teaching any subject can be measured by a teacher's comprehension of what he is teaching, how he goes about it, and when he has to teach it. The "how" of teaching, often termed the teaching method, is crucial. Equally important is the language of instruction, as effective communication cannot occur if the language is incomprehensible to the learner. The critical role of science in cultivating and expanding knowledge highlights why it is integral to the upper primary education curriculum.

Basic education refers to the foundational instruction offered to children aged 6-11 in an educational institution. In the present Nigerian educational system, following the 9-3-4 model, Education in its basic state encompasses the beginning nine years in formal schools, which includes grades from Primary 1 to Junior Secondary School year 3. This period is further segmented into three phases: the first three years constitute the Lower Basic, the next three years make up the Middle Basic, and the final three years, from JSS 1 to JSS 3, are referred to as the Upper Basic years(Igbokwe 2015). Engaging with Basic Science and Technology at the middle and upper primary levels can be captivating. Students typically are naturally curious about simple challenges, whether these are engineered scenarios or issues they encounter in their surrounding

environment (Tokuham-Epinosa, 2015). If science teaching can tackle these challenges and actively engage students using a language they deeply understand—embedded in the educational philosophy of "catch them young"—there could be no subjects more captivating or stimulating for these youthful learners than Science and Technology.

The consistently low academic performance in science among upper basic school students calls into question the effectiveness of the teaching methods and the instructional language teachers use to convey knowledge (Ezugwu et al., 2022). Students' progress in classroom-based science education is influenced by numerous factors, including students' backgrounds, instructional methods, and the child's developmental stage, encompassing chronological and cognitive maturity. These differing elements often lead to the labelling of students as "underachievers" (those with learning obstacles), “dropouts,” and "slow learners," terms usually reserved for underperforming cohorts, while the tag "talented" is applied to the high-achieving group (Nkwo, 2003; Ali, 1998; Oxenhorne, 1992).

Several studies underscore the value of implementing mother tongue instructional strategies to supplement students' grasp of abstract and scientific concepts. Emphasis was made by the National Policy on Education (FRN, 2004) when it advocated employing mother tongue (L1) in means of instruction during the formative three years of children beginning school. Awopetu (2016) observes that harnessing their mother tongue in early childhood and during primary education bolsters their language development at home, further fostering a more substantial understanding of their surrounding environment and societal conventions. Oyewole (2017) proposes that the child's mother tongue is as innate to the child as the mother's milk. He further advocated that in the first twelve years of life, a child should be encouraged to master their mother tongue (MT) as it positively affects their physical, mental, and intellectual development. Taylor and VonFintel (2016) argue that a child's creative potential is elevated when taught in their mother tongue. Proponents of the mentalist view posit that our initial thought process occurs in our mother tongue before we translate these thoughts into another language. Consequently, the mentalist theory implies that children comprehend material faster if the instruction is conveyed in their MT rather than in English. On the other hand, Akpojisheri (2008) highlights the imbalances created by the preferential acknowledgement of specific languages in Nigerian school curricula by the West African Examination Council (WAEC) and National Examination Council (NECO), arguing that this causes more harm than good.

Despite the recognized importance of mother tongue instruction in the foundational years of education and its potential benefits, there remains a lack of empirical evidence regarding its direct impact on academic performance in Basic Science subjects within the Nigerian educational system, particularly at the upper basic level. Moreover, while several studies have explored the overall effects of mother tongue usage on educational outcomes, few have specifically examined its influence on the assimilation of scientific concepts and terminologies critical at this stage of cognitive development. This study is therefore prompted by the need to substantiate the theoretical advantages of mother tongue instruction with concrete data and to address the existing gap in educational research by providing empirical evidence of the effects of employing mother tongue instructional strategies on students' performance in Basic Science subjects in Ilorin Metropolis.

Purpose of the Study

This study's primary aim is to explore the impact of the mother tongue (Yoruba Language) on the performance of Basic students in Science using Upper Basic Schools in Ilorin Metropolis, Kwara State. To achieve this objective, the study embarks on a detailed investigation to determine the following aspects:

If a difference occurs in the mean achievement of students in the upper basic class taught basic science with Yoruba language and those employing English language, mean achievement with gender difference of male and female upper basic students instructed in basic science employing Yoruba language.

Research Questions

1. Is there a significant difference in the mean achievement between upper basic students taught basic science in Yoruba language compared to those taught in English language?
2. Does the mean achievement in basic science vary significantly between male and female upper basic students when taught in the Yoruba language?

Research Hypotheses

These null hypotheses have been proposed to direct this study and will be analyzed at a 0.05 level of significance:

HO1: There is no significant difference in the upper basic student's performance when taught basic science in Yoruba language and those taught in English language.

HO2: The mean achievement in basic science will not vary significantly between male and female upper basic students when taught in the Yoruba language.

Methodology

The research deployed a pre-test/post-test control group quasi-experimental design. The approach involved a normality test, which first determined sample data derived from a normally distributed population (with minimal deviations). The empirical distribution of the data presented a p-value of .003, less than .05, demonstrating no significant variance from normality. The study aimed to gauge the effect of mother tongue instructional strategies on basic science students' performances in upper elementary schools in the Ilorin metropolis. The schema manipulation of the research design is presented as follows:

P1 X1 P4 (E1 - Experimental group 1)

P2 X2 P5 (E2 - Experimental group 2)

P3 X P6 (C- Control Group)

In this schematic representation:

- P1 and P2 signify the pre-test scores for the first and second experimental groups.
- P3 denotes the pre-test scores for the control group.
- P4 and P5 represent the post-test scores for the first and second experimental groups, respectively.
- P6 stands for the post-test scores for the control group.
- X1, X2, and X are symbols for the treatments.
- E1 indicates the first experimental treatment involving the mother tongue instructional strategy.
- E2 signifies the second experimental treatment that combines the mother tongue instructional strategy with a conventional teaching strategy.
- C designates the control group treatment, which involves a conventional teaching strategy.

The population of the study encompasses all the 222,858 upper basic school students in Ilorin metropolis at the time of the research (Open Education Data, 2022), specifically focusing on JSS 3 students. Three Junior Secondary Schools

within Ilorin metropolis, Kwara State, were chosen randomly. An intact class from each selected school participated. Each school was assigned one of the teaching strategies: mother tongue, a combination of mother tongue and conventional teaching, or conventional teaching alone. The participating teachers were all teaching Basic Science to their respective JSS 3 classes.

Data collection was undertaken through the Mother Tongue Basic Science Achievement Test (MTBSAT), divided into two sections. The first section obtained demographic data of the participants, while the second was composed of 15 multiple-choice questions, chosen from the Basic Education Certificate Examination (BECE) past question sets, thus ensuring their validation by examination bodies. The questions pertained to the basic science taught during the experimental phase of the study. The instrument's reliability test yielded a reliability coefficient of 0.796, certifying its reliability for data collection as per Kothari and Gaurav (2016).

The researchers, who are also competent in teaching Basic Science in Yoruba and English, instructed the students on Basic Science topics over a six-week period. Subsequent to the teaching phase, tests were administered, and students' performance was graded. The data collected from both pre-test and post-test was evaluated utilizing inferential statistics through Analysis of Co-variance (ANCOVA) at a .05 significance level. The estimated marginal means were used to assess and compare the mean values of different groups to gauge the extent of differences among them. This analysis helps to identify the variations between the groups.To further identify the specific group(s) responsible for any significant main effect observed, the Bonferroni post-hoc test was utilized. This test allows for a detailed examination of group differences and helps pinpoint which group(s) contributed to the observed significant main effect.

Results

HO_1: There is no significant difference in the upper basic student's performance when taught basic science in Yoruba language and those taught in English language.

Table 1: Analysis of Covariance (ANCOVA) on the performance of students taught with mother tongue and English language.

Source	*Type III Sum of Squares*		*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Corrected Model	5115.481[a]	3	849.240	7.534	.002	.206
Intercept	172214.524	1	172214.524	1932.825	.000	.889
Pretest	1219.813	1	1219.813	13.032	.000	.058
Treatment	**4856.235**	**2**	**2484.483**	**28.956**	**.000***	**.178**
Gender	14.283	1	14.967	.189	.658	.001
Treatment x Gender	47.298	2	22.980	.375	.781	.002
Error	19267.951	227	89.675			
Total	1054851.000	233				
Corrected Total	23366.432	232				

*a. R Squared = .269 (Adjusted R Squared = .233) *significant at p<.05*

Table 1 shows a notable difference in performance among students taught basic science in their mother tongue versus those taught in a foreign language. This difference, which accounted for 23.3% of the variation in performance, was statistically significant ($F(2, 232) = 28.95$; $p<.05$, partial $\eta 2 = .233$). As a result, we rejected our first hypothesis. In other words, teaching basic science in Yoruba positively influenced the students' performance compared to when they were taught in English. To determine the extent of notable variations between the groups under study, we computed the average expected values for each group. The results are presented in Table 2.

Table 2: Estimated marginal means for students' performance by treatment and control groups.

			95% Confidence Interval	
Treatment	**Mean**	**Std. Error**	**Lower Bound**	**Upper Bound**
Experimental group 1 (Mother tongue strategy)	69.45	1.03	67.44	72.17
Experimental group 2 (Mother tongue and conventional strategy)	65.03	1.08	62.88	69.13
Control group (conventional strategy)	57.09	1.14	55.66	59.20

Table 2 shows that the group of students taught with the Mother Tongue Strategy (MTS) scored the highest post-performance score in Basic Science (69.45). They were followed by the group taught with a combination of Mother Tongue and Conventional Strategy (MTCS) with a score of 65.03, and lastly, the group taught with the Conventional Strategy (CS) alone, scoring 57.09. In order, the scores are represented as MTS > MTCS > CS. To identify which group significantly influenced these variations in Basic Science performance, a Bonferroni post-hoc test was conducted among the groups. The findings are shown in Table 3.

Table 3:Bonferroni post-hoc analysis

Treatment	**Mean**	**MTS**	**MTCS**	**CS**
Experimental group 1 (MTS)	69.45			*
Experimental group 2 (MTCS)	65.03			*
Control group (CS)	57.09	*	*	

Table 3 indicates no difference in the post-performance scores in Basic Science between students instructed with the Mother Tongue Strategy (MTS) and those taught through a combined Mother Tongue and Conventional Strategy (MTCS). However, it does show that both these groups considerably outperformed the students taught using only the Conventional Strategy (CS). This implies that the significant divergences identified in the ANCOVA results originate from the distinctions between the treatment groups (MTS and MTCS) and the control group (CS), rather than from within the treatment groups themselves, in regard to the students' post-performance scores in Basic Science.

HO2: The mean achievement in basic science will not vary significantly between male and female upper basic students when taught in the Yoruba language.

As shown in Table 1 above, there is not a significant difference in student's performance between boys and girls ($F(2, 232) = .19$; $p>.05$, partial $\eta 2 = .00$). Consequently, the second hypothesis was not rejected. Hence, gender does not significantly impact student's academic performance when taught basic science using Yoruba mother tongue.

Summary of major findings

1. **Language of Instruction:** The study revealed a statistically significant difference in the performance of students taught basic science in the Yoruba language compared to those taught in English. The results showed that students taught in their mother tongue, Yoruba, performed better than those taught in English, leading to the rejection of the first hypothesis (HO1). The difference in performance explained 23.3% of the variation, as indicated by the ANCOVA results. Students utilizing the Mother Tongue Strategy (MTS) scored highest, followed by those with a combination of Mother Tongue and Conventional Strategy (MTCS), and finally, those with the Conventional Strategy (CS) alone.
2. **Gender Differences:** The second hypothesis (HO2) posited that there would be no significant difference in performance between male and female students when taught in Yoruba. The findings did not show a significant difference in performance based on gender, suggesting that both male and female students performed similarly when instruction was delivered in their mother tongue. Therefore, the second hypothesis was not rejected, indicating that gender did not significantly impact the students' academic performance in this context.

Discussion and Conclusion

This study found that using the mother tongue in teaching significantly improved Basic Science performance in upper basic school students. The highest post-performance scores were seen in students taught with the Mother Tongue Strategy (MTS), followed by those taught with both Mother Tongue and Conventional Strategy (MTCS). The lowest scores were from the Conventional Strategy (CS) group, which served as a control group. Thus, our findings align with Awodun and Oyeniyi (2018) argument that the right teaching strategy can enhance understanding in Basic Science.

The greater effectiveness of the Mother Tongue Strategy (MTS) compared to the Mother Tongue plus Conventional Strategy (MTCS) in improving student performance could come from students learning in their native language. This process involves instruction and questioning in their first language, helping to link new knowledge with their familiar surroundings. The students' engagement and active participation in class through the use of their mother tongue could also boost learning outcomes. As Nolasco (2010) noted, using a student's first language in education allows them to explain and construct knowledge freely, articulate thoughts, and integrate new ideas with their existing knowledge without worrying about errors.

This research aligns with the interdependence theory's assumption that literacy skills can positively transfer from a child's first language (L1) to a second language (L2). It suggests that a child's success in learning a second language can

depend on their proficiency in their first language when they start intensive instruction in the second language. If educational systems immerse students in a second language without developing their first language skills, it could hinder their second language skills and limit their first language's autonomous growth. This effectiveness of using the mother tongue was supported by Owolabi et al. (2022), reporting a better performance when the mother language (in this case, Yoruba) was used for teaching and learning. This resonates with findings from Adeleye & Ogunremi (2017), who found better achievement when students were taught in their mother tongue versus a foreign one. A study by Ricablanca (2014) had similar results, showing significantly higher scores for students taught in their mother tongue, even in retention tests. This lends weight to UNESCO's (2008) claim that mother tongue instruction is crucial for effective learning. However, it counters Ife's (2017) claim that the mother tongue has no significant impact on mathematics achievement. The findings also show that teaching with a combination of mother tongue and conventional strategy can significantly improve student performance in Basic Science compared to just using a conventional approach.

This study found that gender doesn't significantly impact students' performance in Basic Science, showing that a student's gender doesn't affect their Basic Science outcomes. This may be due to equal opportunities and active participation conditions for all students. Our findings align with Ricablanca's (2014) research, showing no significant gender differences in student achievement. Ife's (2017) findings, which show no significant gender effect on science subject achievement, and Abubakar & Oguguo's (2011) report, which found that gender doesn't influence mathematics achievement, support this conclusion. However, it contradicts Anjum's (2015) findings, which argue that gender significantly affects science subject performance, with girls outperforming boys.

Conclusion

The study concluded that students had better academic results in Basic Science when taught in their mother tongue. The use of the mother tongue as the instruction language had a significant effect on students' academic performance in Basic Science. However, a student's gender didn't significantly impact their academic performance in Basic Science when the mother tongue was used for teaching.

Recommendations

In light of the above results and discoveries, the subsequent recommendations are proposed:

1. Implement Teacher Training Programs for Mother Tongue Instruction: Educational authorities should initiate and sustain in-service training programs for Basic Science teachers, focusing on effective mother tongue instructional strategies and pedagogical methods. These programs should aim to enhance teachers' proficiency in delivering the curriculum in the mother tongue, specifically emphasizing context-relevant teaching materials and assessment techniques. By doing so, teachers will be more equipped to facilitate learning that leverages students' linguistic and cultural backgrounds, potentially leading to improved academic outcomes in Basic Science.
2. Integrate Mother Tongue Instruction in Curriculum Planning: Policymakers and curriculum developers should reform the Basic Science curriculum to systematically integrate mother tongue instruction into the teaching

framework, particularly for the foundational years. This integration should involve developing and distributing quality educational resources, including textbooks and multimedia content in the mother tongue, that cater to the diverse learning needs of students. Additionally, a gradual transition strategy to English or other languages of instruction should be mapped out, ensuring that students have established a robust foundational knowledge in Basic Science through their mother tongue before transitioning to a second language.

References

Adeleye, I. A., & Ogunremi, P. (2017). Promoting Nigerian languages for sustainable development in Nigeria, (eds). Further thoughts on language, education and the curriculum nexus for sustainable development in Nigeria. *A festschrift in honour of Professor Clement Olusegun Olaniran Kolawole*.

Akpojisheri, M. O. (2008) Reforms and Innovation in Language Education: The Way Forward. Paper presented at Fifth Annual Conference of National Association of Nigeria Teachers.

Ali, A. (1998). Strategies Issues and Trends in Science Education in Africa. Onitsha: Cape Publisher International Limited.

Anjum, S. (2015). Gender difference in mathematics achievement and its relation with reading comprehension of children at upper primary stage. *Journal of Education and Practice, 6*(16), 71-75.

Awodun, A., &Oyenyi, A. (2018). Effect of Instructional Simulation on Students' Academic Performance in Basic Science in Junior Secondary School in Ekiti State, Nigeria. *International Journal of Research and Analytical Reviews*, *5*(2), 23-27.

Awopetu, A. V. (2016). Impact of mother tongue on children's learning abilities in the early childhood classroom. *Procedia-Social and Behavioral Sciences*, *233*, 58-63.

Ezugwu, I. J., Mbonu-Adigwe, B. U., Ibenegbu, Q. & Okoye, M. N. (2022) Students' academic achievement in Basic Science and task persistence as predictors of achievement in senior secondary school Biology. *Journal of the Nigerian Academy of Education,* 277 – 296.

Federal Republic of Nigeria (2004). National Policy on Education. Yaba, Lagos.NERDC Press.

Federal Republic of Nigeria, FRN (2004). *National Policy on Education (revised edition)*. Lagos: Government Press.

Flores, N., & Rosa, J. (2015). Undoing appropriateness: Raciolinguistic ideologies and language diversity in education. *Harvard Educational Review*, *85*(2), 149-171.

Igbokwe, C. O. (2015). Recent curriculum reforms at the basic education level in Nigeria aimed at catching them young to create change. *American Journal of Educational Research*, *3*(1), 31-37.

Joga, S. (2013) International Opinion on Language Issues: Mother Tongue is the key to Education, knowledge, science, and English learning. Madaan Publishing House: Punjabi.

Kiyici, B. &Kiyici, M. (2007) Science, Technology and Literacy. *The Turkish Online Journal of Educational Technology – TOJET,* 6(2), 1 – 5.

Kobori, H., Dickinson, J. L., Washitani, I., Sakurai, R., Amano, T., Komatsu, N., ... & Miller-Rushing, A. J. (2016). Citizen science: a new approach to advance

ecology, education, and conservation. *Ecological research*, *31*, 1-19.

Kramsch, C. (2014). Language and culture. *AILA review*, *27*(1), 30-55.

Nkwo, N. I. (2003). Effects of Guided Inquiry and Demonstration methods on secondary
school students‟ acquisition of process skills in Physics. Unpublished M. Sc. (Ed). Thesis. University of Uyo, Uyo.

Owolabi, H. O., Olaoye, D. D., Olaoye, O. T., & Olatunji, R. A. (2022). Effect Of Yoruba as Language of Instruction in Social Studies on Junior Secondary School Student's Performance in Ilorin-West, Kwara State. *African Journal of Humanities and Contemporary Education Research*, *6*(1), 40-52.

Oxenhorne, J. M. (1992). Teaching Science to Underachievers in Secondary School. NewYork. Globe Book Company

Oyewole, O. (2017). Influence of mother tongue in the teaching and learning of English language in selected secondary schools in Ondo State, Nigeria. *Journal of Education and Practice*, *8*(30), 55-64.

Poincaré, H. (2022). *The foundations of science: Science and hypothesis, the value of science, science and method*. DigiCat.

Ricablance, J. D. (2014). *Effectiveness of mother tongue-based instruction on pupils' achievement in mathematics*. A Master project of the Central Mindanao University, Philippines

Taylor, S., & von Fintel, M. (2016). Estimating the impact of language of instruction in South African primary schools: A fixed effects approach. *Economics of Education Review*, *50*, 75-89.

Tokuhama-Espinosa, T. (2015). *The new science of teaching and learning: Using the best of mind, brain, and education science in the classroom*. Teachers College Press.

UNESCO (2008). *Mother tongue matters: Local languages as a key to effective learning*. Paris: UNESCO.