https://doi.org/10.52970/grsse.v4i1.395

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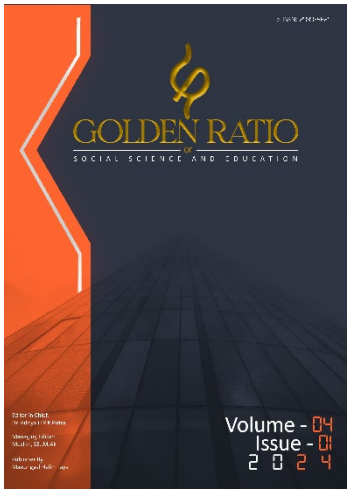
OPEN ACCESS

ISSN [Online] 27975827



Received: March 24, 2023
Revised: April 22, 2024
Accepted: April 24, 2024

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SOCIAL SCIENCE AND EDUCATION | RESEARCH ARTICLE

Effects of Mother Tongue Instruction on Students Mathematical Achievement in the Bekwai Municipal, Ghana

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Abstract: The study examined the effect of the mother tongue teaching on students' mathematical achievement. From St. Joseph Senior High Technical School, two experimental classes and one control class were chosen. While the control group was instructed only in English, the first experimental group was instructed exclusively in their native language (Twi), whereas the second experimental class was instructed using mother tongue (Twi) as an additional medium of instruction. The results of the pre-test and post-test were statistically examined using the t-test. The findings showed that using Twi as the sole teaching language and using English as the only training language were equally unsuccessful, while mother tongue (Twi) was found to be statistically significant in improving students' mathematics achievement.

Keywords: Twi Only Instruction, English Only Instruction, Twi As An Additional Instruction, Students Mathematics Achievement.

1. Introduction

Mother-language instruction is a common way for parents to begin educating young children. Native speakers of this language speak it well, and it is a language that children learn (Dialyn et al., 2014). Throughout their early years, children are exposed to and learn this dialect (United Nations Educational, Scientific, and Cultural Organisation, 1953). To communicate with another person or group of people, language is necessary (Ezekiel et al., Ghana, 2020). This is particularly true when one wants to make another person aware of a problem, piece of information, occasion, circumstance, or incident. While there are many influences on effective education in the field of mathematics, it is vital to understand that the medium of tutoring serves as an essential element (Benson, 2016; Espada, 2012). According to Essien (2010) effective communication skills on the part of the instructor are among some of the crucial aspects of teaching elementary mathematical concepts. A number of African scholars, including Monroe (1996), Chitera (2010), and Makonye (2015), have endorsed the benefits of language in mathematics instruction. Language is an essential tool because it provides the basis for generating ideas that establish significant links between ideas (Monroe 1996); it also plays an important role in conveying information to students. Language is vital for educating, acquiring knowledge, and communicating meaning (Makonye, 2015). The author goes on to say that the use of language is important since ideas related to mathematics are conveyed through communication. It is frequently recommended that children in lower elementary schools receive instruction in their mother tongues (MT) (UNESCO, 2003). Teaching mathematics to students in their mother tongue helps them understand it better (Oginni & Owolabi, 2013).

Many advantages come from teaching mathematics to children in their native language, such as resolving a deficiency of familiarity with strange concepts in mathematics and allowing the child to build up certain mathematical techniques that are easily used and recalled, making mathematics understandable and interesting to those who lack English literacy (Abiri, 1990). According to the Global Campaign for Education (2013), Children who were exposed to mathematics in another

https://doi.org/10.52970/grsse.v4i1.395
Website: https://goldenratio.id/index.php/grsse/index ISSN [Online] 27975827

country's language scored less than those who got education in their native tongue. Students who studied mathematics using their own language outperformed students who learned it in a foreign dialect (Krashen, 1999).

Furthermore, teaching Mathematics to children in their mother tongues has advantages, such as helping them learn more foreign Mathematical terms and bringing them closer to the subject (Omoniyi et al., 2013). The authors added that young children in rural areas pick up the language faster in their native tongue, and Fafunwa (1977) found that young children learn easier when educated in their local language than when taught in a different language. According to Besa (2013), the Philippines' basic education system adopted mother tongue-based language (MTBL) instruction due to the positive effects of student multilingualism. For students to be engaged in mathematics and to understand what they are studying, Matang (2003) emphasised that it is important to incorporate their culture into the subject. It is challenging to neglect the mother tongue while continuing to anticipate outstanding results, considering how essential it is to children's culture. The author concluded that providing children with traditional education in their mother tongue before they enter school enhances their academic performance; therefore, parents are advised to provide their children with the needed assistance and opportunity to be fluent in their first language, as doing so will make it simpler for them to succeed in formal education (Okeworo, 2014).

In Ghana, mathematics is a required subject in the school system, and academic success depends on mastering it. Nonetheless, mathematics education in senior high schools (SHS) must only be delivered in English, according to Ghana's instructional language policy (Ghana's instructional language policy, 2002). This approach has drawn criticism for failing to recognise the importance of teaching in the local languages and for failing to conduct a sufficient evaluation of its effects on student mathematics performance (Acheampong, 2004). This has a detrimental effect on students' academic performance in mathematics, as many of them are unable to read, write, speak, and understand English well by the time they graduate from high school (Shefiu, Ghana, 2018). Research indicates that instruction in a student's mother tongue may improve the student's comprehension of mathematical concepts (UNESCO, 2003). However, little research has been done on mother language education, particularly in secondary education (Piper et al., 2018). The teaching of mother language in primary and junior high schools in Ghana has been the subject of increased study, but senior high school instruction has not been the focus of as much of it. Consequently, the influence of mother tongue teaching as the primary and additional medium of instruction among senior high school students in the Bekwai Municipality was the gap that this research covered. The study seeks to (1) Determine the effect of foreign language (English) as the only medium of instruction on students' mathematics achievement; (2) Determine to the effect of mother tongue as the only medium of instruction on students' mathematics achievement; (3) Determine the effect of mother tongue as an additional medium of instruction on students' mathematics achievement. So that, the research Questions is (1) What is the effect of foreign language (English) as the only medium of instruction on students' mathematics achievement? (2) What is the effect of mother tongue as the only medium of instruction on students' mathematics achievement? (3) What is the effect of mother tongue as an additional medium of instruction on students' mathematics achievement?

2. Literature Review

In Ashanti Region, research by Adu-Gyamfi and Twum (2014) examined how using Twi as a second language for instruction affected pupils' arithmetic achievement. It was shown that Twi exposure significantly improved student performance compared to English-only instruction. Like this, Koomson (2017) examined the impact of local language on students' arithmetic proficiency in Ghanaian basic schools. It was quite evident that mother language improved the method of teaching mathematical concepts and comprehension in the discipline. Additionally, Amoako (2019) did a study on how native language utilisation as a mode of tutoring affected mathematics success of students. The study discovered that using students' native languages improved their comprehension of mathematical ideas and mathematical achievement. Israel et al. (2013) also did a study to determine how children in primary schools perform mathematically in relation to their mother tongue and mathematical language. They found that when mathematics lessons were taught in a language that

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ISSN [Online] 27975827

learners were acquainted with, they comprehended the concepts of mathematics easily. According to their claims, students were less likely to quickly forget mathematical topics when they were taught in their native tongue.

However, some research has also revealed no significant improvement in pupils' mathematical proficiency when local languages were employed as the primary instructional language. For instance, Owusu et al. (2021) performed a study on the influence of employing the students' native languages as the teaching medium on their mathematical success in a few chosen basic schools in Ghana. When compared to when English was used as a means of teaching, the study showed no discernible disparity in the mathematical success of students when their native language was employed as the means of instruction. Additionally, Hafiz and Farik (2016) found that employing the students' home language was ineffective since there was no improvement in students' mathematical ability when the local dialect was used as a means of teaching. They claimed that using the students' native language as their learning medium resulted in significantly low student achievement. A study by Abiodu and Modupe (2021, Nigeria), mother tongue is a supplementary teaching method that works well when learners' mother tongue is added to the teaching of mathematics. They claimed that pupils' attitudes towards mathematics had significantly improved.

3. Research Method and Materials

3.1. Population, Sample and Data Collection

A quasi-experimental design was used in this study. A quasi-experimental approach does not use random assignment to place participants in the control and experimental groups. The researcher alters the independent variable in a quasi-experiment to make sure that participants do not have an equal chance of being allocated to the two groups (White & Sabal, 2014). A quasi-experiment involves the researcher choosing pre-existing, comparable groups and allocating them to the various treatments. Students from St. Joseph Senior High Technical School participated in the research. There were 1389 mixed students enrolled at St. Joseph Senior High Technical School.

3.2. Sampling of Students

From St. Joseph SHTS, two experimental classes and one control class were chosen. The control group only received instruction in English; the first experimental group only received instruction in Twi, whereas the second experimental class received instruction in both Twi and English Language (Twi as an additional instruction).

3.3. Research Instruments

A test called the Mathematics Achievement Test (MAT) was used to evaluate students' achievement. Twenty (20) multiple-choice questions and two (2) theoretical essays were employed. This was done to compare student achievement levels prior to and following the intervention.

4. Results and Discussion

The pre-test and post-test results for the students in the control and experimental groups were analyzed. The paired sample t-test was used to assess whether there were any statistically significant differences between the pre-test and post-test results for instruction in the mother tongue, mother tongue as an additional instruction and English only instruction.

4.1. Descriptive Statistics for English Only (Control) Instruction

According to the research, the pre-test score for only English instruction had a minimum score of 2 and a maximum score of 20, with a mean of 12.22 and a standard deviation of 6.266. For the English class, the post-test had a minimum score of 3 and a maximum score of 20, with a mean of 13.13 and a standard deviation of 6.497. The fact that there was not a significant increase in the

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ISSN [Online] 27975827

students' post-test mean score indicates that English education alone was ineffective in raising their mathematics ability, as seen by the 0.91 difference between the pre-test and post-test means.

4.2. Descriptive Statistics for Twi only Instruction

The pre-test results for the Twi class alone showed a minimum score of 6 and a maximum score of 20, with a mean of 13.52 and a standard deviation of 4.389. In the post-test, the Twi class had a mean score of 12.9 and a standard deviation of 5.440, with a minimum score of 5 and a maximum score of 20. Since the students' post-test mean score did not improve after using Twi as the major medium of instruction, it may be concluded that using Twi alone was ineffective for teaching mathematics.

4.3. Descriptive Statistics for Twi as an additional medium of instruction

According to the study, the pre-test scores for both the English and Twi class (Twi as an additional instruction) had a minimum score of 0 and a maximum score of 20, with a mean of 9.83 and a standard deviation of 6.120. The minimum score in the post-test was 5 and the maximum score was 20, with a mean of 12.79 and a standard deviation of 5.381 for both English and Twi class. This indicates that both English and Twi instruction (Twi as an additional instruction) improved students' performance in Mathematics since the mean score of the post-test was extremely higher than the pre-test mean score.

Table 1. Descriptive Statistics for Twi as an additional, Twi only and English Only Instruction

Descriptive Statistics	N	Minimum	Maximum	Mean	Std.Deviation
Twi As an Additional Instruction					
Pretest_Score	24	0	20	9.83	6.120
Posttest_Score	24	5	20	12.79	5.381
Twi Only Instruction					
Pretest_Score	23	6	20	13.52	4.389
Posttest_Score	23	5	20	12.96	5.440
English Only					
Pretest_Score	23	2	20	12.22	6.266
Posttest_Score	23	3	20	13.13	6.497

What is the effect of the foreign language (English) as the only medium of instruction on students' mathematics achievement?

As can be seen, table 2 shows that the control class had an alpha-value of 0.05 and a p-value of 0.070. Since the p-value (0.070) was higher than the alpha-value (0.05), this indicates that there was no statistically significant difference between the pre-test and post-test results for students who only received English instruction. This suggests that increasing students' mathematics ability by teaching just in English was ineffective.

What is the effect of mother tongue (Twi) as the only medium of instruction on students' mathematics achievement?

The first experimental class (Twi alone) in Table 2 had a p-value of 0.518 and an alpha-value of 0.05.Since the p-value (0.518) was higher than the alpha-value (0.05) ,this indicates that there was no statistically significant difference between the pre-test and post-test results of students who received only Twi instruction. This suggests that Twi as the only medium of instruction was ineffective in improving students' mathematical proficiency.

What is the effect of mother tongue as an additional medium of instruction on students' mathematics achievement?

https://doi.org/10.52970/grsse.v4i1.395
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In table 2, the second experimental class (Twi as an additional instruction) had a p-value of 0.00, an alpha-value of 0.05, which means that there was a statistically significant effect between the pre-test and the post-test scores of students who were instructed in both English and Twi (Twi as an additional instruction). This implies that Twi, as an additional medium of instruction, was effective in improving the mathematical performance of the students.

Table 2: Test of Significant Difference between the Pre-Test and Post-Test Results of Twi only, English Only and Twi as an Additional Instruction

	Mean	t-value	Confidence Interval	P-value
Twi as an Additional Instruction Pretest Score	9.83	-2.679	(-5.242,-0.674)	0.000***
Posttest Score	12.79			
Only Twi Instruction				
Pretest Score	13.52	0.418	(-2.240,3.370)	0.518
Posttest score	12.96			
Only English Instruction				
Pretest Score	12.22	-1.159	(-2.546,0.720)	0.070
Posttest score	13.13			

4.4. Discussion

The impact of mother-language education on student's mathematical success was examined in this study. Pre-test and post-test results were compared in a quasi-experiment. The fact that there was no statistically significant difference in the results for English-only training suggests that this kind of education was unsuccessful in improving students' mathematics performance. The results were in line with research from 2021 by Owusu-Fordjour et al., which showed that using English as a teaching language in Ghanaian primary schools had little to no effect on students' growth in mathematics. The results also matched with Apkabio (2013), who found that senior secondary students' mathematical proficiency did not increase when English was the exclusive language of teaching. According to Zafarullah (2010) study on the influence of teaching mathematical terminology in English and the native tongue on the learning of secondary school pupils, It was discovered that using English as a medium of instruction was more effective than using learners' native languages since these students performed worse. English language learners outperform students who were taught in their native tongue academically. According to the findings, English language teaching should be the only medium employed at the senior high school level to increase educational standards and students' mathematical achievement.

The study also looked at the effects of using Twi as the main language of instruction. The results of the research showed that learners who only got Twi instruction did not significantly vary in their pre-test and post-test results. It was determined that using mother tongue (Twi) as the only teaching approach was unsuccessful. The results were consistent with Hafiz and Farik (2016), who found that teaching students exclusively in their native tongue did not improve their mathematical proficiency. The results were consistent with Bacolod et al. (2021), who discovered that poor mathematical ability prevented L1 from being used as the major language of teaching for primary school pupils, proving the ineffectiveness of mother tongue instruction. The results contrasted with Patrick and Theresa's (2015) research, which found that students learned mathematical concepts more easily and familiarly when instruction was provided in their native Igbo dialect. In contrast to the study's conclusions, Marilyn et al. (2019) discovered that second-grade children's arithmetic proficiency increased with native language instruction. Moreover, the results of the research were in opposition to Njoroge (2017), who found that students who were taught exclusively in their native tongue performed better in mathematics. The research found that students who received all of their education in their mother tongue understood mathematical concepts better and were less likely to lose them. Moreover, the study findings contradicted Sunday et al. (2021), who found that mother language as the only medium of instruction, had a significant influence on the achievement of both junior and senior

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Website: https://goldenratio.id/index.php/grsse/index
ISSN [Online] 27975827

secondary school mathematics students. As a result, it was advocated that Yoruba should be used in teaching mathematics to Yoruba-speaking students in high school and that teachers and parents should encourage their children to prioritise learning their mother tongue.

On the other hand, the impact of native language (Twi) as an additional medium of teaching was also examined. The results showed that employing local language (Twi) as an additional means of teaching was successful in improving students' mathematics achievement since the p-value of 0.00 was less than an alpha-value of 0.05, implying that there was a statistically significant difference between the pretest and posttest scores. The study findings aligned with the findings of Abiodu and Modupe's (2021, Nigeria) study, which found that pupils who received instruction purely in their native language performed worse than those who received it in addition to other types of education. As a result, it was recommended that, to succeed in mathematics, native language teaching should not be employed as the major form of teaching but rather as an additional language while studying the subject. Similarly, the study findings aligned with Fate D (2022) research, which found that after getting instruction in both their mother tongue and English, students' performance greatly improved on the post-test. This illustrates that, it is feasible to increase students' mathematics skills by utilising both their native languages and English. According to Agyei and Agyemang (2019), who also endorsed the study findings, using Twi as an additional teaching medium increased students' success in mathematics. The study findings also corresponded with the findings of Adedayo et al. (2021), who verified that adopting local language as an extra medium of teaching can improve learner success. It was endorsed, among other things, that the local language be included as an extra medium of teaching and learning. Moreover, the findings agreed with Mathhooko (2009), who discovered that using learners' ethnic language as an additional medium of teaching in the classroom provides more efficient formal education to learners, improves consistency in their educational process, and fosters their cognitive growth.

5. Conclusion

The study revealed that mother tongue (Twi) as an additional means of teaching had a statistically significant effect on senior high school students' mathematical accomplishment. The study also revealed that teaching students only in English or their native language (Twi) did not improve their mathematics proficiency. Based on the study's findings, the government should enable senior high school teachers to supplement their lessons with the student's mother tongue while teaching mathematics. This would allow students to comprehend the fundamentals of what is being taught and foster an interest in it by fully engaging and communicating effectively. It was also suggested that future researchers should duplicate this study to incorporate new locations and characteristics in addition to those included in it.

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