Exploring the Role of Mother Tongue in Mathematics Education: Benefits and Challenges of Language Localization

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ABSTRACT

Language serves as a fundamental medium for communication and comprehension in the classroom, particularly in subjects such as mathematics, where abstract concepts are often conveyed through verbal and written instruction. However, for learners whose home language differs from the dominant language used in educational settings, language can become a barrier rather than a bridge to understanding. This study explores the experiences of mathematics teachers in implementing Mother Tongue-Based Multilingual Education (MTB-MLE) in Grades 1 to 3 at a public elementary school in Davao del Sur. Using a qualitative phenomenological design, data were collected through Key Informant Interviews (KII) and analyzed thematically. Findings revealed that using the mother tongue in mathematics instruction enhances student attentiveness, participation, comprehension, and confidence in expressing ideas. However, challenges emerged, including difficulties in translating mathematical terms, learners' limited vocabulary in the local language, and the lack of instructional materials in Sinugbuanong Bisaya. To address these challenges, teachers employed strategies such as using real objects, promoting cooperative learning, adjusting unfamiliar terms, and incorporating technology. The study highlights the importance of the mother tongue in improving learning outcomes and recommends stronger institutional support, localized teaching resources, and ongoing teacher training to ensure the effective implementation of MTB-MLE in mathematics education.

INTRODUCTION

Language plays a crucial role in communication and understanding within the classroom, where learning is predominantly facilitated through language. Both teachers and students rely on spoken and written language to engage in various tasks, demonstrate knowledge and skills, and foster relationships, all of which contribute to the educational environment (Amerstorfer & von Münster-Kistner, 2021). However, for some individuals, particularly those who speak a cultural and demographic language different from the dominant language, language can become a burden and a barrier. This is especially true in countries where English, as a medium of instruction, is used without regard to the child's native language (Garcia, 2019). Consequently, it is essential for schools to integrate and teach the curriculum in a language that children can understand, allowing them to connect learning experiences at both home and school through their mother tongue.

Various studies emphasize the importance of integrating the mother tongue into the curriculum, highlighting its significant role in learners' development. Nishanthi (2020) argued for the necessity of providing learners with the opportunity to learn in both their mother tongue and the official language. Escarda et al. (2024) further emphasized the holistic benefits of mother tongue education, noting that it enables learners to develop their mental, moral, and physical capacities to confront life's challenges. This suggests that the mother tongue has a profound influence on individual development, particularly in shaping one's thoughts and emotions. Additionally, beyond personal development, the use of the mother tongue can contribute to fostering a positive perception of the world and one's life (Prahan, 2024). Consequently, this approach may enhance learners' performance in school, at home, and within society, as they are allowed to express their own identity throughout the learning process.

The urgency of utilizing the mother tongue in education is evident, highlighting the need for schools to teach the curriculum in a language that learners understand. A bilingual or even multilingual approach, which combines ongoing instruction in a child's mother tongue with the gradual introduction of a second language, has been shown to enhance performance in the second language as well as in other academic subjects (Ball, 2019). This

approach is commonly referred to as Bilingual and Multilingual Education, or more specifically, Mother Tongue-Based Education (MTB-MLE). According to Monje et al. (2021), MTB-MLE is defined as any form of schooling that uses the language(s) with which children are most familiar, typically the language they speak at home with their families. In the Philippines, the Department of Education (DepEd) defines MTB-MLE as a form of education, whether formal or non-formal, that strengthens learners' mother tongue to improve literacy and competency both in school and for lifelong learning. This method is often integrated into various disciplines, with mathematics being one of the most common areas for its application.

The language background of learners can significantly influence educational outcomes (Smith, 2017; Peng et al., 2020), particularly in the understanding of mathematics, which often involves mathematical terminology typically presented in English. Contextualizing mathematics involves recognizing and building on the mathematical knowledge that students already possess by incorporating their first language. This approach provides experiences and strategies that allow students to derive meaning and develop the language skills necessary to extend their mathematical abilities (Diag & Dillo, 2022). Forbes et al. (2021) highlighted the significance of three essential aspects when using a multilingual classroom: students' experiences with languages and language acquisition, their perceptions of languages and their identity as language learners (as well as how others perceive these languages), and their emotional responses to language learning. This highlights that using mother tongue instruction enables learners to express themselves, engage with their learning more effectively, and better grasp mathematical concepts.

The importance of integrating the mother tongue into the curriculum across various disciplines is supported by a range of perspectives. Globally, the implementation of mother tongue education has been observed in various regions. In South America, for example, the Bilingual Intercultural Education Sector Policy in Peru (2016) and the Avelino Siña Law of Education in Bolivia (2010) have been instrumental in promoting mother tongue education. Barbaran et al. (2011) highlighted that learners taught in their mother tongue demonstrated greater proficiency in both language and mathematics, as well as significantly higher levels of self-esteem. In South Africa, the use of mother tongue learning has led to improvements in student enrollment, passing rates, and a reduction in dropout rates. Indigenous students, in particular, benefited from the ability to engage with their language, which allowed them to participate in the production and dissemination of knowledge (Battiste, 2018).

In Asia, a region rich in cultural and linguistic diversity, numerous efforts have been made to provide quality education to ethnic minority children, youth, and adults. The Asia-Pacific Program of Education for All (APPEAL) has been instrumental in supporting twelve countries—Bangladesh, Cambodia, China, India, Indonesia, Nepal, the Philippines, Thailand, Vietnam, Malaysia, Lao PDR, and Afghanistan—in implementing pilot projects on literacy programs that utilize mother-tongue or bilingual teaching and learning methods. These efforts aim to promote educational development by viewing the language(s) of the learner as resources rather than obstacles (UNESCO, 2008). In Indonesia, for example, the mother tongue is used as the language of instruction in the early stages of education, when needed, to deliver knowledge and skills. This mother tongue-based approach is designed to enhance literacy within communities by using a familiar language not only for introducing literacy but also as the primary medium of instruction (Asmarasanti & Apriyanti, 2024).

Building on the developments and implementations observed in neighboring countries, the Philippines has adopted the Mother Tongue-Based Multilingual Education (MTB-MLE) as a key component of the new K-12 program in its educational system. This initiative is particularly emphasized in Kindergarten, Grades 1, 2, and 3 (Department of Education [DepEd], 2016). Under this framework, the mother tongue is used as the primary medium of instruction across all learning areas from Kindergarten to Grade 3, with the exception of Filipino and English subjects. Currently, the DepEd provides teaching materials in a variety of local languages, including Bahasa-Sug, Bicolano, Cebuano, Chavacano, Hiligaynon, Ilokano, Kapampangan, Maguindanaoan, Maranao, Pangasinense, Tagalog, and Waray-Waray. Additionally, the DepEd is in the process of developing materials in other regional languages such as Ybanag, Ivatan, Sambal, Aklanon, Kinaray-a, Yakan, and Surigaonon (Casalan, 2022).

However, the educational system in the Philippines faces a significant challenge in terms of the lack of reading and instructional materials in local languages. This deficiency creates obstacles for the effectiveness of bilingual education, particularly for linguistic minorities. One area of concern is the role of teachers, who are responsible

for imparting knowledge to students. To address this issue, it is crucial to begin by addressing the concerns of teachers, as they play a vital role in the implementation of not only the mother tongue instruction policy but also other educational reforms at the classroom level. Therefore, this research aims to explore the experiences of teachers in implementing the Mother Tongue-Based Multilingual Education (MTB-MLE) in mathematics, examining their perspectives and identifying strategies to make such instruction both feasible and effective.

Mathematics in the Philippines

Mathematics education in the Philippines is a key priority for the Department of Education (DepEd), yet Filipino students continue to underperform in international assessments. In the 2022 Programme for International Student Assessment (PISA), the Philippines ranked 76th out of 81 countries in mathematics, with an average score of 355, which is significantly below the OECD average of 472 (Organisation for Economic Co-operation and Development, 2023). Similarly, the 2019 Trends in International Mathematics and Science Study (TIMSS) reported a score of 297, well below the international average of 500 (Richardson et al., 2020). These results reflect ongoing challenges such as limited educational resources, insufficient teacher training, and inadequate instructional methods. Despite reforms like the K-12 curriculum and mother-tongue-based education, targeted efforts are still needed to address these issues and improve student performance.

Research indicates that sociocultural and environmental factors significantly influence the development of mathematical skills, potentially contributing to gaps in the learning process (Silver & Libertus, 2022; Olszewski-Kubilius et al., 2023). Many countries recognize the importance of mathematics, particularly due to its emphasis on higher-order thinking skills (Widana et al., 2018). However, it has been observed that Filipino students often excel in acquiring knowledge but struggle with developing a deeper understanding of mathematical concepts. This issue has become a growing concern for the country, particularly in the education sector, as students' discouraging academic performance calls for a reevaluation of both the teaching methods and evaluation processes in mathematics. Such a review is necessary to ensure that students are not only able to recall mathematical knowledge but also to understand and apply it meaningfully.

Learning mathematics occurs when students have mastered basic mathematical skills, which are essential for developing numerical literacy, appreciating mathematical concepts, and advancing to more complex topics. Mathematics is also regarded as the language of the sciences and other disciplines, functioning as a symbolic means of communication (Yadav, 2019). It plays a critical role in enhancing students' general decision-making and problem-solving abilities. Academic performance, in this context, refers to a student's ability to study and retain facts, as well as their capacity to cope with various tasks, which can be measured through examination results.

Advantages of Mother Tongue-Based Education

Being taught in a familiar language or in the mother tongue is a crucial element of quality education for all learners. According to the Nishanthi (2020), early education in the mother tongue helps prepare children for school and fosters foundational skills, such as literacy and critical thinking, which have been proven to significantly enhance learning outcomes. With mother tongue education, learners are more likely to cope with and continue their education, as it helps them build confidence and a sense of identity. Consequently, Mother Tongue-Based Multilingual Education (MTB-MLE) plays a vital role in supporting learners. As noted by Evans and Nthulana (2018), the advantages of mother tongue education include assisting learners in grasping difficult concepts, expressing themselves with confidence, fostering pride in their culture, and ensuring a smoother transition from the home environment to school. However, this approach may be accompanied by challenges, such as limited vocabulary.

It is undeniable that, due to globalization, countries often adopt the dominant language to meet various demands, particularly the widespread use of English. However, there are instances where learners are deprived of the opportunity to use their mother tongue, leading to potential psychological and cultural consequences. Psychologically, this can result in a diminished sense of identity for the child, as their connection to their native language weakens. This, in turn, can lead to significant cultural loss (Mufwene, 2017). The inability to express oneself in one's native language can affect a child's self-esteem and hinder their full cultural integration, highlighting the importance of maintaining mother tongue education alongside global language learning.

Challenges of Mother Tongue-Based Education

While numerous studies highlight the benefits of Mother Tongue-Based Education (MTBE), Gaylo (2020) outlines several drawbacks that should not be overlooked. First, instructional materials are often scarce in many local languages, making it difficult for teachers to deliver lessons effectively. The absence of necessary resources such as textbooks, articles, journals, charts, and handbooks in the mother tongue can hinder the teaching process. Second, many teachers are not adequately trained in the local languages used for instruction. Even when training is provided, many teachers feel unprepared to teach the subject due to a lack of resources and fluency in the mother tongue. They are often accustomed to teaching in English or Filipino, which poses challenges in adopting the mother tongue for all subjects. Third, elementary school teachers, particularly those teaching Kindergarten through Grade 3, may lack solid training in first language (L1) or second language (L2) learning theories, research, and strategies. This gap in professional development can make it difficult for teachers to effectively impart knowledge, assess student learning, and provide appropriate learning experiences. Fourth, some local languages may not be perceived as valuable for formal education, which can undermine the support for mother tongue instruction. Finally, some parents may view MTBE as a disadvantage for their children's future employability, especially in a context where English is highly valued. These issues represent significant challenges that any government promoting an MTBE policy must address. Failing to consider these factors could lead to ineffective implementation and potentially compromise the success of the initiative.

With the shift in the medium of instruction to the mother tongue, the vision is for teachers to foster lively classroom interactions and facilitate the self-expression of every learner, as students will be communicating in their native language. The success of Mother Tongue-Based Multilingual Education (MTB-MLE) programs largely depends on the effectiveness of the teachers in the classroom (Escarda et al., 2024). Teachers play a critical role in creating an environment where students feel comfortable expressing themselves, engaging with the material, and making meaningful connections to their learning. Their ability to adapt teaching strategies and provide the necessary support in the mother tongue is essential for the successful implementation of MTB-MLE programs.

Theoretical Lenses

Language plays a crucial role in the learning process, and in the Philippines, the use of both national languages and local languages has shaped the educational landscape. Recent reforms in the K-12 curriculum introduced Mother Tongue-Based Multilingual Education (MTB-MLE), emphasizing the use of students' native languages in instruction. This study draws on the Behaviorist Theory, Mentalist Theory, and Cognitive Academic Mathematics Proficiency (CAMP) model to explore the impact of MTB-MLE. The Behaviorist Theory highlights habit formation in language learning, where consistent reinforcement helps learners acquire language, as shown in Skinner’s operant conditioning. Chomsky’s Mentalist Theory, on the other hand, emphasizes the innate Language Acquisition Device (LAD), which allows children to subconsciously internalize grammar based on exposure to language. Additionally, Cognitive Academic Mathematics Proficiency (CAMP) parallels language proficiency, stressing the need for both mathematical knowledge and the language to express it. Studies show that using a child’s mother tongue in early education enhances their learning of both language and mathematical concepts. By using their native language, students can express ideas more confidently, contributing to a deeper understanding and improved academic performance, especially in subjects like mathematics.

Purpose of the Study. This phenomenological qualitative study aims to explore the advantages, disadvantages, and strategies of using the mother tongue in teaching mathematics, as experienced by elementary school teachers in Digos City, Davao del Sur. By examining teachers' lived experiences, the study seeks to understand how the mother tongue affects teaching practices, student learning outcomes, and classroom dynamics.

Research Questions

1. What are the advantages and disadvantages of Mother Tongue-Based Multilingual Education (MTB-MLE) in teaching Mathematics?

2. What strategies do the participants employ in implementing Mother Tongue-Based Multilingual Education in teaching Mathematics?

3. What suggestions can the participants provide regarding the use of the mother tongue in teaching Mathematics to other educators and in the academic community?

METHODOLOGY

This chapter of the study outlines the methods used in conducting the research. It includes the study design, participants, setting, sampling, techniques for determining and collecting information, the role of the researcher, data analysis and interpretation, methods for presenting results, and the trustworthiness and ethical considerations involved in analyzing the data.

Study Design. The data for the present study were collected using a qualitative phenomenological research design. According to Donalek (2004), phenomenological research is a qualitative approach that involves examining the lived experiences of individuals selected as participants. As Creswell (2007) emphasized, the primary objective of phenomenology is "to reduce individual experiences with a phenomenon to a description of the universal essence." By entering into the participants' experiences, the goal was to provide an explanation of the phenomenon and shed light on the realities they encountered. Consequently, this study aimed to describe the experiences of teachers in teaching mathematics using the mother tongue, including the advantages, disadvantages, and strategies they employed.

Study Participants. The participants of this study were teachers who were teaching mathematics in Grades 1 to 3 using the mother-tongue approach in a public elementary school in Davao del Sur. They are the appropriate participants of the study for the reason that they teach mathematics in primary grades using their mother tongue.

Setting. The participants in this study were teachers who teach mathematics in Grades 1 to 3 using the mother-tongue approach at a public elementary school in the province of Davao del Sur. These participants were selected because they are directly involved in teaching mathematics at the primary grade levels using the mother-tongue method, making them the most suitable individuals to provide relevant insights for the study.

Sampling. In selecting the participants for this study, the researcher utilized a purposive sampling procedure. This sampling technique allowed the researcher to choose participants who could provide valuable insights into the research problem and the central phenomenon of the study (Creswell, 2009). Purposive sampling is commonly used in qualitative research because it enables the collection of specific information that can be analyzed in depth (Patton, 1990). This method was deemed most appropriate for the study, as the researcher specifically sought to select ten (10) teachers who are actively teaching mathematics using the mother-tongue approach. According to Giri (2024), purposive sampling is a type of non-probability sampling, which is particularly effective when studying a specific cultural domain and when guided by a knowledgeable individual.

Technique in Determining Information. To ensure proper guidance throughout the study, a priori categories for the questions were established. The researcher developed an interview guide with questions directly aligned to the main research questions of the study. Additional questions were asked based on the participants' responses, allowing for flexibility and deeper exploration. In analyzing and interpreting the data, the researcher followed the recommendations of Colton and Convert (2007), who suggested sorting and categorizing data by applying a coding system to identify recurring themes. This process also involved comparing and contrasting responses and connecting information to unverified data. The data were analyzed in accordance with the qualitative research framework outlined by Creswell (2012), ensuring a systematic and thorough approach to interpretation.

Collection of Information. This study employed a single data collection tool, namely the Key Informant Interview (KII), to gather information from the participants regarding their experiences, challenges, and strategies in teaching mathematics through Mother Tongue-Based Multilingual Education (MTB-MLE) to Grades 1 to 3 pupils. According to Akhter (2022), a Key Informant Interview involves conducting in-depth interviews with selected participants to obtain detailed insights. Accordingly, the researcher visited a public elementary school in Davao del Sur, where they conducted both observations and interviews to gather comprehensive information and perform a thorough analysis of the participants' responses.

Role of the Researcher. The researcher served as the primary instrument in this qualitative inquiry, as is common in many similar studies where data is directly collected through the researchers' interactions with the

participants (Patton, 2015). The central role of the researchers was to inform others about the findings of the study, which would be beneficial to them, based on the interactions with the individuals being studied.

In this study, the researcher assumed various roles, including that of facilitator, interviewer, writer of procedural guidelines, as well as transcriber and analyst of the data. Acting as the primary instrument in the research, the researcher was responsible for explaining the data collection process to the key informants and ensuring that the collected data was well-organized and easily accessible for further analysis. The researcher was also accountable for all stages of the data process, maintaining the accuracy, reliability, and accessibility of the data throughout the study.

Analysis and Interpretation of Data. Given that a phenomenological qualitative research design was employed in this study, the gathered information was analyzed using thematic analysis. According to Braun and Clarke (2006), thematic analysis is the method for identifying, analyzing, and reporting patterns (themes) within data. This approach helped in reviewing the data, making notes, and categorizing the information effectively. As a data analytic strategy, thematic analysis allowed the study to transition from an initial broad reading of the data towards identifying patterns and developing themes. Thematic analysis is a flexible method, and its application can vary depending on the specific objectives of the research and the analytic process. As such, many researchers use it to gain a closer understanding of their data, fostering a deeper appreciation of the content. In this study, our focus was on identifying broader patterns within the data to inform a more nuanced analysis, using thematic analysis as an initial step towards uncovering significant themes.

Ethical Considerations. Guided by research ethics standards, the concerns and needs of the research participants were prioritized to uphold their rights and foster trust throughout the study. As outlined in The Belmont Report by the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research (1979), as cited by Miracle (2016), three core ethical principles must be upheld: respect for persons, beneficence, and justice. In accordance with the principle of respect for persons, voluntary participation was ensured, and participants' autonomy in making informed decisions regarding their involvement in the study was emphasized. In line with beneficence, steps were taken to minimize potential harm to participants while maximizing the benefits of the study, prioritizing their safety and well-being throughout the research process. The principle of justice was also central, ensuring fair treatment and equal consideration for all participants by maintaining consistency and fairness in the questions posed to each participant. Furthermore, extensive measures were taken to address privacy and confidentiality concerns. The importance of safeguarding participants' personal experiences and insights was recognized, and all data collected was kept confidential. Participants were informed of their right to control how their personal information was shared, and ethical standards set forth by institutions such as Ross et al. (2013) were adhered to. Privacy and confidentiality were fundamental aspects of ethical responsibility, not only to ensure the integrity of the research but also to respect participants' rights as individuals. These actions fostered a safe and trustworthy environment, allowing participants to freely share their experiences without concerns about the misuse of their personal information.

RESULTS

After conducting the interviews, the data were analyzed using thematic analysis and presented in two clusters based on the research questions. The first cluster focused on the advantages and disadvantages of Mother Tongue-Based Multilingual Education in teaching Mathematics, highlighting both the positive and negative experiences of teachers when using the mother tongue in math instruction. The second cluster explored the strategies employed by teachers in implementing Mother Tongue-Based Multilingual Education in teaching Mathematics.

The Advantages of Mother Tongue-Based Multilingual Education in Teaching Mathematics

In order to determine the perspectives of primary mathematics teachers regarding the advantages of using the mother tongue as a medium of instruction in teaching mathematics, sub-questions were formulated. Teachers were specifically asked about the positive contributions of using the mother tongue in teaching mathematics and their positive experiences while teaching math through this approach. Following the method outlined by Vaismoradi et al. (2016), significant statements with similar meanings were grouped together, and meanings

were subsequently formulated based on these groupings. From these formulated meanings, five key themes emerged: (1) effectiveness of the mother tongue, (2) enhanced understanding that elicits active responses, (3) easy and fast learning, (4) active participation of learners, and (5) learners' openness to sharing their ideas. These themes reflect the various advantages perceived by teachers in utilizing the mother tongue in mathematics instruction.

Attentiveness. Learners become more participative in activities and attentive during class discussions when they can clearly understand the instructions provided by the teacher. This indicates that students are more likely to be active participants when they have a clear understanding of the topic. One informant highlighted this by stating, "You can really see learning because of the active response and understanding shown by children" (KII 3). Another informant shared, "Children are very attentive and participative because if it is in English, they immediately go to the side" (KII 5). In the same way, children quickly raise their hands when the teacher asks questions related to the topic. They demonstrate confidence in sharing their answers and ideas because they understand the terms used in the mathematics class. Additionally, they are able to comprehend the topic presented by their mathematics teachers, as they can understand the terms spoken and written in their first language, such as writing numbers in words and reading them aloud.

Easy and Fast Learning. The informants observed that when the medium of instruction used is the mother tongue, learners can easily understand the lesson. Learners tend to learn faster because they can comprehend the language more easily than English. One informant supported this observation by stating, "They can easily understand the subject matter because the medium of instruction used is Bisaya" (KII 9). Learners are able to decipher the content of the lesson more quickly when taught in their mother tongue because they can grasp the meaning faster than when using the English language. Additionally, learners are able to recall terms more easily when they encounter them again through the teacher's spoken words during math discussions. Furthermore, they can learn mathematical terms and concepts presented in the mother tongue more effectively, enhancing their overall learning experience.

Active participation. One of the most notable experiences of primary teachers when using the mother tongue as a medium of instruction in teaching mathematics is the active participation observed among learners. Learners are able to interact with their classmates, share ideas, and engage in discussions. As one informant shared, "They really participate, and it is easy for them to understand because it is Bisaya" (KII 5). This reflects that when learners understand the language used in mathematics instruction, they can actively engage not only in class discussions but also in various activities. The familiarity with the medium of instruction allows learners to participate confidently and without hesitation, fostering a more interactive and inclusive classroom environment.

Learners' openness of sharing their ideas. The use of the first language in teaching mathematics fosters learners' openness, which has been observed by primary teachers during their math classes. Learners become more expressive, sharing their thoughts and ideas regarding the lesson. As one informant stated, "The learners can express themselves because mother tongue is used (KII 10). Using the mother tongue as the medium of instruction, especially in mathematics, allows learners to better understand the lesson, as they do not have to translate mathematical terms into English during oral recitations. This understanding enhances their ability to elaborate on their answers and explain concepts thoroughly in front of the class. Furthermore, the learners feel more confident expressing their ideas in their mother tongue, as it is the language they are most familiar with and use to communicate at home.

However, challenges arise due to the limited vocabulary of learners in more complex mathematical terms in their mother tongue. One participant shared, "There are some terms in the mother tongue that are used in Mathematics which learners cannot understand" (KII 1). This highlights a limitation in the vocabulary available in the mother tongue for in-depth mathematical terms, which sometimes hinders learners' full comprehension of the lesson.

The Disadvantages of Mother Tongue-Based Multilingual Education in Teaching Mathematics

In relation to the disadvantages of teaching mathematics using the mother tongue, sub-questions were posed to gather the perspectives of primary mathematics teachers on the challenges they faced and their negative experiences with this approach. From the responses, three primary themes emerged: difficulty in making learners

understand unfamiliar terms, the challenge of translating mathematical terminology, and the limited availability of instructional materials. These themes highlight the difficulties teachers encounter when implementing Mother Tongue-Based Multilingual Education (MTB-MLE) in mathematics instruction. While students can relate to the language, unfamiliar terms in the mother tongue sometimes hinder comprehension. Additionally, translating mathematical terms between the mother tongue and English often causes confusion. Furthermore, the lack of instructional materials in the mother tongue complicates teaching, reducing the effectiveness of this educational approach.

Making Learners Understand Unfamiliar Terms. While there were positive effects of using the Mother Tongue as a medium of instruction, participants also shared the challenges they faced. Some mathematical terms remained difficult for learners to understand. One participant noted, “Sinugbuanong Bisaya (Cebuano language) is different from our Bisaya [Dabawenyong Bisaya], which is why there are some terms that I find difficult to explain to the students, as they struggle with the terms used” (KII 5). This highlights the difficulty teachers face in explaining mathematical concepts to students when the Sinugbuanong Bisaya, used as the medium of instruction, differs from the Bisaya the learners are familiar with. Additionally, one informant mentioned that learners could not even understand "*pilo-piloon*" for "multiplication," further emphasizing the challenges in bridging language gaps in teaching mathematics.

Translating Mathematical Terminologies. The informants shared that mother tongue instruction helps aid students' understanding of lesson content, particularly in mathematics. However, they also expressed difficulty in translating mathematical terms from English into Bisaya. One informant noted, “It is hard to translate math terms written in English into Bisaya” (K2, 1.3). Another informant echoed this sentiment, stating, “I have difficulty in translating some mathematical terms written in English into Bisaya.” (KIII 5). These statements highlight the challenge teachers face in trying to make mathematical instruction more accessible and understandable through the use of the mother tongue.

Limited Instructional Materials. One of the challenges identified by the participants was the limited availability of instructional materials in Sinugbuanong Bisaya for teaching mathematics. Despite utilizing the internet to search for resources, the majority of available materials were in English, which required the teachers to translate them into their local language. As one informant noted, "When I search on the internet for activities in Mathematics, the internet provides me materials in English, so I have to translate them still into Bisaya" (KII 2). Several other informants expressed similar difficulties in translating English-language instructions and activity procedures into Sinugbuanong Bisaya, highlighting the gap in resources tailored to the use of the mother tongue in mathematics instruction. This limitation posed a challenge for the teachers, who had to expend extra effort to adapt materials, potentially affecting the efficiency of the teaching process.

Teacher’s Strategies Implementing Mother Tongue-Based Multilingual Education in Teaching Mathematics

Informants were also asked about the strategies they used in implementing Mother Tongue-Based Multilingual Education in teaching mathematics. After grouping significant statements with similar meanings, the researcher formulated key insights, which led to the identification of four themes: support with real objects, cooperative learning, effectiveness in delivering instruction, and alteration of terms. These themes reflect the strategies teachers employ to enhance understanding and facilitate the use of the mother tongue in mathematics instruction.

Support with Real Objects. Mathematics is inherently abstract, with many of its concepts represented through equations, formulas, and calculations that are primarily written on paper. Teachers strive to make these abstract concepts more accessible to students. As one participant noted, "I use realia, real objects, and visual aids in teaching math using the mother tongue because there is really a difference when learners have something to manipulate and see the object in actual" (KII 6). This hands-on approach allows students to interact with tangible materials, making abstract mathematical concepts more comprehensible. Additionally, teachers employ counters, such as popsicle sticks, to assist students in becoming familiar with numbers. One informant mentioned, "I have counters like popsicles that I am using so that learners will become familiar with numbers, especially since there are terms in our mother tongue that they find difficult" (KII 1). These manipulatives help students visualize and internalize the concept of numbers and counting. The use of real objects and visual aids

proves to be an effective strategy in supporting learners to grasp mathematical concepts more easily and effectively.

Cooperative Learning. Cooperation and collaboration among learners are essential strategies for fostering an effective classroom environment. These approaches encourage students to be more socially active and participative in the learning process. As one participant mentioned, "Through group activities, group work, and cooperative learning, they can help one another, especially in math using the mother tongue" (KII 3). This collaborative approach enables students to work together, share ideas, and assist each other in understanding mathematical concepts. Group activities provide a supportive space where learners can express their thoughts and engage with their peers, enhancing their learning experience, particularly when the instruction is delivered in the mother tongue. This not only promotes peer support but also reinforces their understanding of mathematical concepts by facilitating communication in a language they are most comfortable with.

Teacher's Suggestions towards the other Teachers and in the Academe in Utilizing Mother Tongue in Teaching Mathematics

Alteration of Terms. In regard to improving the teaching of mathematics using the mother tongue, the participants interviewed shared similar views based on their personal experiences. They noted that certain mathematical terms in Bisaya are unfamiliar to some learners. In response, teachers suggested that when some terms in the mother tongue, specifically "Sinugbuanong Binisaya," are not easily understood by students, adjustments could be made to use terms that learners are more familiar with. As one participant explained, "If there are terms that confuse the students, I just use the terms that they can understand" (KII 3). This approach highlights the need for flexibility in language use to ensure comprehension. Additionally, another participant suggested that the use of the local variety of Bisaya would improve understanding: "It should be the local Bisaya language" (KII 5). This recommendation reflects the importance of adapting the language of instruction to the specific dialect used within the community. By using terms that are more familiar to students, teachers can help make mathematical concepts more accessible and relatable.

Utilize Technology in Teaching. The advancement of global education has led to the enhancement of instructional materials for presenting lessons in the classroom, particularly as we enter the 21st century. In this era, teachers are encouraged to utilize technology to better engage 21st-century learners. One informant suggested, "There should be devices in which learners can manipulate and the teacher can do research, such as action songs in Bisaya connected to math" (KII 5). This statement highlights the potential of technology to support interactive and engaging lessons, where both learners and teachers can actively participate in the learning process. Moreover, another informant emphasized the importance of technology in teaching, stating, "On the part of the teacher, it is also good if we use technology" (KII 9). The integration of technology allows learners to manipulate tools, engage with interactive content, and experience a more dynamic learning environment. Many software applications and videos for teaching mathematics are available, and teachers can easily download these resources for classroom use. Several informants recognized the significance of utilizing technology to cater to the needs of 21st-century learners, suggesting that it offers numerous opportunities for more engaging and effective teaching.

DISCUSSION

Currently, teachers handling mathematics classes using the mother tongue as the language of instruction, as well as future educators like ourselves, can greatly benefit from this study. The researcher believes that this topic, being both global and essential, deserves thorough examination, particularly with regard to its effectiveness. As pointed out by UNESCO (2025), approximately a billion learners in low- and middle-income countries enter classrooms unable to understand the language in which lessons are delivered. This situation places these children at a significant disadvantage, as they struggle to understand and engage with lessons in an unfamiliar language. In contrast, the implementation of Mother Tongue-Based Multilingual Education (MTB-MLE) provides a more accessible and effective way of learning, especially for students whose home languages differ from the language of instruction in schools.

The advantages, disadvantages, strategies, and suggestions presented by the participants in this study offer valuable insights for educators. The research focused on the experiences and strategies of primary mathematics teachers who use mother tongue as the language of instruction. Despite concerns regarding the availability of resources and materials that are suitable for mother tongue-based math instruction, all participants, regardless of the grade level they teach, expressed positive views about MTB-MLE. They noted that it facilitates better communication within the classroom, even amidst the challenges. The findings suggest that using the mother tongue in teaching mathematics enhances the learning experience, though it is also worth noting that some teachers have had mixed experiences.

Advantages of Teaching Mathematics Using Mother Tongue

The study highlighted several key advantages of using mother tongue in mathematics instruction. First, learners tend to be more attentive when lessons are delivered in their first language. Second, teaching through the mother tongue facilitates faster and easier learning. Third, it encourages greater active participation from learners. Lastly, it fosters openness and confidence in sharing ideas among students.

Among these benefits, increased attentiveness was identified as a key advantage by participants. Many reported that students were more focused and engaged when lessons were taught in their mother tongue. This is likely because children are already familiar with their first language, which enhances their ability to grasp and follow instructions. As Agarwal (2010) suggests, learners are more likely to be attentive when taught in their native language. Similarly, Kioko (2015) emphasized that learners tend to engage more effectively when instruction is provided in their home language, which in turn aids comprehension.

Additionally, active participation was often highlighted by participants as an important benefit. For instance, a report of the Department of Education (2016) found that learners were more participative and attentive in classroom discussions when taught in their first language. This is indicative of a more learner-centered approach, where students are actively involved in the learning process. Participants in this study noted that when mathematics lessons were delivered in their mother tongue, students felt more comfortable asking questions, offering answers, and engaging in discussions. This not only enhanced their participation but also helped strengthen their cultural identity, as the use of their native language made them feel more connected and understood. Furthermore, studies support the notion that active participation in class can positively impact academic performance in mathematics (Du et al., 2025; Lugosi & Uribe, 2022; Nurbavliyev et al., 2022).

Another key advantage identified was the ability for learners to better express their ideas. When taught in their mother tongue, students found it easier to organize and articulate their thoughts clearly, whether in group discussions or individual recitations. As noted by Vacalares (2023), students who are initially taught in their mother tongue tend to perform better academically, as they feel more confident in their ability to communicate. This sentiment is supported by Nishanthi (2020), who highlighted the importance of mother tongue-based education in allowing children to fully express their knowledge and competence. Participants in this study similarly observed that students felt more comfortable sharing their ideas in class when lessons were conducted in their native language.

Strategies for Overcoming Challenges

To address the challenges encountered in teaching mathematics using the mother tongue, participants implemented various strategies that contributed to a more effective teaching and learning process. One prominent strategy was the use of real objects and manipulatives, such as counters, popsicle sticks, and dried beans. These materials allowed learners to physically manipulate and visualize mathematical concepts, which enhanced their understanding. As asserted by Caldeira and Sampaio (2025), the use of tangible materials is essential in promoting active engagement, helping students connect abstract mathematical ideas with concrete experiences. In addition to manipulatives, many participants also employed cooperative learning strategies, where learners collaborated in groups to complete tasks, share ideas, and solve problems together. This approach fostered teamwork and peer support, which, as Azhar (2023) suggests, leads to improved academic performance and deeper understanding of the subject matter. By encouraging learners to work collaboratively, teachers were able to create a more interactive and supportive classroom environment.

Suggestions for Improvement

In addition to the strategies mentioned, participants provided several suggestions for enhancing the teaching of mathematics using the mother tongue. A common recommendation was to modify difficult or unfamiliar terms in the mother tongue to ensure they were comprehensible to learners. This approach, which involves adjusting terms without altering their underlying meaning, was seen as a practical way to facilitate better understanding of mathematical concepts. Participants also emphasized the importance of incorporating technology into the teaching process. They suggested that access to devices, which learners could manipulate and teachers could use to find Bisaya language resources, would make lessons more engaging and interactive. Higgins et al. (2019) highlight the significant role of technology in motivating learners and improving their academic performance. When technology is integrated into the classroom, it fosters higher levels of engagement and allows for more dynamic and effective teaching of mathematics. By utilizing digital tools, teachers can enhance participation and provide learners with diverse, interactive ways to grasp mathematical concepts.

Implication of the Study

The utilization of the mother tongue plays a crucial role in making learning more accessible to all students. The findings of the study reveal that its implementation strengthens both teachers' and students' interactions. Participants shared that using the mother tongue helped students perform better and become more active in the learning process, contributing to a sense of satisfaction for the teachers, knowing that learners truly grasped the lessons. This approach also serves as inspiration for students, showing them that their teachers, through the integration of the mother tongue and real objects, can effectively enhance learning. The insights shared by the participants, including their advice and suggestions, highlight the importance of connecting language with real objects to make learning more engaging and easier to understand, especially in mathematics. For those in the academic community, it is essential to prioritize the teachers' need for adequate instructional materials to support the effective delivery of lessons and the implementation of multilingual education. Therefore, the research urge educational authorities to address the ongoing concern of resource and material deficiencies to better support teachers in fulfilling their instructional duties.

For future research, a suggestion in conducting a study to explore teachers' experiences in transitioning from mother tongue instruction to English instruction, typically beginning at the Grade 4 level. This study could provide valuable insights into the concerns discussed in this research, particularly the role of mother tongue as a bridge to learning a second language. It would help assess how the shift impacts both teaching practices and students' language development.

CONCLUDING REMARKS

Similar to the experiences of the mathematics teachers in this study, the use of the mother tongue proves to be both helpful and meaningful in making lessons more accessible and understandable for young learners. The findings further align with the study by Le Menestrel and Takanishi (2017), which emphasizes the importance of using the mother tongue as a medium of instruction in fostering both a child's identity and cognitive development, essential elements for educational success. Additionally, teachers expressed enthusiasm for finding innovative ways to make mother tongue-based mathematics instruction more engaging, such as incorporating real objects and instructional materials that enhance student learning. Reflecting the sentiment of one participant, she shared, *'Okay jud ang mother tongue kay maka-express jud ang mga bata sa ilang ideas*' (Mother tongue is really effective because it allows children to express their ideas). This statement highlights the importance of the mother tongue in enabling students to express themselves clearly, using their own dialect to form coherent thoughts.

Moreover, conducting the study acted as a preparatory experience for the researcher, as the challenges encountered by the participants could similarly become their own if they were to enter the teaching profession, especially at the elementary level in public schools. It became clear that teaching is both fascinating and challenging, requiring various considerations. Listening to the experiences of in-service teachers has been truly inspiring, motivating a deeper commitment to the teaching profession. This study contributes to the existing literature by shedding light on the advantages, disadvantages, strategies, and challenges of MTB-MLE

instruction. The findings underscore the crucial role teachers play in supporting students' learning through innovative strategies and their ability to overcome barriers. Therefore, the Department of Education is encouraged to develop a system for assessing, monitoring, and evaluating teachers' innovative strategies and challenges, while also designing effective programs or models of MTB-MLE to better support teachers in its successful implementation.

Finally, it is believed that the findings of this investigation will not only benefit the participants and researchers but also mathematics teachers, educators in other disciplines, school administrators, educational organizations, and governing bodies, both within and beyond the academic milieu. However, this study has certain limitations. Given the specific context of the study, the findings may not fully represent the experiences of all teachers, both locally and internationally. Nevertheless, the study has revealed trends that warrant further investigation.

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