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PERSPECTIVES OF ELEMENTARY MATHEMATICS TEACHERS ON THE STATUS OF IMPLEMENTATION AND IMPACT OF MOTHER TONGUEBASED (MTB) INSTRUCTION TOWARDS AN INTERVENTION PLAN

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Abstract: *This study delved into mother tongue-based instruction (MTBI) status and its impact on elementary pupils' mathematics performance during the academic year 2023-2024 in the Hermosa district. Employing an explanatory mixed-methods research design, purposive sampling is used to select grade 1 to 3 teachers with varying expertise, linguistic backgrounds, and knowledge of MTBI to provide diverse perspectives. The semi-structured interview guide was used in the qualitative component, and the survey questionnaire was used for the quantitative part. The study analyzed data using frequency, percentages, standard deviations, and Pearson r coefficient correlation. The results showed that MTBI variables, such as curriculum and resources, teacher competence, assessment tools, and pedagogical approaches, are highly implemented by respondents. MTBI significantly impacts students' mathematics performance, including achievement, learner interaction, examination performance, and long-term academic success. Correlation analysis confirmed these findings, with moderate positive correlations between MTBI and educational outcomes. However, language proficiency issues, pedagogical adaptation complexities, and resource constraints were identified. The study emphasizes the significance of MTBI integration in elementary mathematics education, emphasizing the need to tackle challenges to enhance students' academic performance and learning experiences.*

Keywords: *Educational management, mother tongue-based instruction, sequential explanatory mixed-methods design, Bataan, Philippines.*

INTRODUCTION

Language, the center of education and cognition, affects math performance. In diverse and multicultural countries, mother tongue versus second language medium in elementary education is a major issue. This study evaluates basic math achievement using mother tongue-based education. It may seem obvious, but the language of instruction can bridge or increase the gap between students' linguistic and cognitive capacities and affect topic engagement and understanding, which can effect student performance. Many language and education research have studied how language instruction affects academic performance, especially in arithmetic. These studies demonstrate the costs and benefits of mother tongue-based multilingual education. As Ricablanca (2014) investigated in Central Mindanao, mother tongue-based instruction may improve maths learning attribution and functioning. However, little is known about its effects. Fernando (2020) observed that Waray-Waray speakers performed better in arithmetic classes utilizing their mother tongue. Likewise, Englis et al. (2021). Practical benefits and problems of mother tongue primary maths. Opoku-Amankwa et al. (2015) examined the socio-political issues of bilingual education in Ghana and expanded language policy discussions. The study examined mother tongue-based education and learning results. Daby (2015) reported boosts in second language learning and academic performance. After Nally's (2022) and Pogoy's (2023) studies of in-depth learning for mother-tongue-based problems, Lall & South (2016) examined Myanmar's language/education-identity imbalance. Additionally, Apolonio (2022) examined the larger implications of MTB-MLE on language learning and education in the Philippines and how it has become a marker for pedagogy and language learning style. Sanchez et al. (2013) found similar effects globally, and Cervantes District (2023) and Adedoyin and Adegoju (2019) in Nigeria found that teaching mathematics in learners' home languages improved understanding and application.

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Walter (2016) also summarizes MTB+-MLE pilot program data, disagreeing that it maintains languages and promotes learning. Overall, MTB-MLE improves educational outcomes and promotes language variety and cultural identity in varied circumstances. This is especially true in ASEAN literature, which describes how varied situations might implement mother tongue-based education. A Study of Ten Years of Multilingual Education Policy Experience in Thailand by Person and Premsrirat (2018) examined the benefits, obstacles, and difficulties of multilingual education policy implementation in a multicultural country. In an original work, Thako and Waters (2023) analyze the complex relationship between education, identity, and nationalism on the Thai-Burmese border and how mother tongue education might overcome societal divides. Taylor-Leech (2015) examines non-dominant language instruction in Timor-Leste. It illustrates that language policy to promote diversity is difficult. Timor-Leste: The politics of English language education policy (Macalister, 2016) examines global language dynamics and local English input strategies. A decade later, Rosales (2022) used a qualitative approach to examine language attitudes in the Philippines, prompting us to pay attention to ASEAN educator/learner thinking about multilingualism. Locally, many studies contradict the practical benefits and innovations of mother tongue-based education for Filipino teachers. De Jesus (2021): Practical multilingual classroom practices to overcome pedagogical problems. Gempeso et al. (2021) used deterritorialization to address the discrepancy between educational policy and classroom practice. An amorphous language approach (Belvis & Morauda-Gutierrez, 2019)2 gives a novel perspective on classroom linguistic variety and assessment. The Aperocho (2023) policy reform framework for mother tongue-based education found that enhancing student results needed more than clear guidelines—it requires specific roadmaps for actual implementation. Corlet and Tarusan (2022) examined Indigenous Peoples (IP) teachers' mother tongue-based teaching experiences in less ordinary, culturally varied areas. The need for inclusive and context-specific multilingual education taught educators, policymakers, and researchers valuable insights.

FRAMEWORK

Vygotsky's (1978) Zone of Proximal Development (ZPD) models how MTBI affects elementary children' math achievement. This theory emphasizes the gap between what learners can do without help and what they can do with help, which promotes MTBI via boosting understanding and cognitive growth. MTBI is legal in the Philippines by DepEd Order No.16,s. 2012, and mother tongue–multilingual education (MTB-MLE) elaboration guidelines were based on DepEd Order No.74, 2009. Such policies promote native language inclusion in education, creating a culturally and linguistically suitable system. Global, ASEAN, and Philippine studies illuminate MTBI's complexity and potential. Caffery et al. (2014) reported language retention and education results from their successful MTBI pilot project in Timor-Leste. ASEAN studies like South and Lall (2016) and Mangshang (2022) show how MTBI improves access and equity across varied contexts. Similar local research (De Jesus, Gempeso et al., 2021). Philippine MTBI methods and theory: Classroom alignment and math performance. Despite these findings, MTBI definition, implementation, and evaluation deficiencies remain. MTBI's practical consequences are unclear due to conflicting methodology and a paucity of empirical investigations, especially in ASEAN. Previous theoretical discussions in multilingual mathematics instruction and instances of supporting multilingual classrooms with an intervention system will be used to fill these gaps. Linguistic Relativity and Interdependence Hypotheses (Cummins, 1979, 2000) support MTBI. The first argues that mother language competence promotes second language learning and academic performance, while the second highlights how language impacts mental processes. Teachers can foster comprehension, wisdom, and progress by teaching math

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in the mother tongue. This helps students apply math to real-life situations, improving recall and problem-solving. According to ideas, employing students' home languages provides a literal context for math learning.

OBJECTIVES OF THE STUDY

This study explored the status and impact of mother tongue-based instruction in teaching mathematics to elementary pupils in Hermosa District for the School Year 2023-2024.

METHODOLOGY

Research Design

This explanatory mixed-methods study examines the complex relationship between urban mobility tourism flows using quantitative and qualitative data. The quantitative phase will use numerical data to assess mother tongue-based instruction's effects on math scores, while the qualitative phase will use interviews or open-ended questionnaires with teachers, students, and parents to examine contextual factors. (Creswell 2014).

Quantitative data will measure results, whereas qualitative data will provide causes and perceptions. Integration of these two data sets provides a complete picture of educational process and intervention impact.

To interpret statistical trends in quantitative data, researchers will compare and contrast findings from both data sets and examine instructors' and parents' educational techniques. One data set will be strengthened by triangulation to support nuanced findings. (2007) Creswell & Plano

The mixed approach design will help compare primary students from different streams' mathematics performance and explain the occurrence. The findings and participants' experience will be protected by responsibly collecting quantitative and qualitative data. This method reveals complexity and maintains contributors' dignity and responsibilities throughout research.

Research Site

The study is conducted in the Hermosa District of Bataan, Philippines, focusing on elementary teachers who implement mother tongue-based education, especially in mathematics. The research aims to understand how mother tongue-based instruction affects students' mathematical performance. Purposive sampling was used to select teachers with specific characteristics, such as teaching experience, diverse linguistic background, and familiarity with mother tongue-based instruction. The study ensures that participants possess the knowledge and experience to contribute meaningfully to the research.

Participants

The distribution of research participants among the various schools is shown in the table. It indicates that 47 elementary teachers from five schools participated in the study's quantitative component, comprising surveys or well-structured questionnaires. Additionally, one participant from each institution participates in the study's qualitative phase, which probably involves lengthy interviews or focus groups. The comprehensiveness and depth of the study's findings are increased by this sampling technique, which guarantees both quantitative data from a relatively more significant group and in-depth insights from a more limited but diverse set of individuals. On the other hand, Creswell (2012) said that in qualitative research, the number of participants needed for a study could vary depending on several factors, including the research question, the complexity of the topic, the depth of analysis required, and the methodological approach. Creswell, a prominent researcher in qualitative analysis, has provided guidance suggesting that a sample size of around 5 to 10 participants

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is often sufficient for qualitative research, particularly in studies focused on in-depth exploration and understanding of phenomena rather than generalizability.

Table 1
Participants of the study

Level	Quantitative Respondents	Qualitative Participants
Pandatung ES	6	1
Culis ES	11	1
Casupanan ES	15	1
Mambog ES	10	1
Sumalo IS	5	1
TOTAL	47	5

Instrumentation

The research employs a questionnaire and an interviewing guide for quantitative and qualitative data collection. The questionnaire, adapted from Puno, Aries & Guzman, Barbie & Ferrer, and Catherine's (2023) study, Teacher's Perception of MTB-MLE Implementation in Teaching English and Mathematics, is validated and pilot-tested to ensure its reliability and efficacy. Its clarity, language, and order of questions were addressed through pilot testing. The questionnaire was reviewed by master's teachers at Sumalo Integrated School, school principals, and language teachers. The final draft was presented to the adviser for pilot testing, with the Cronbach Alpha of the SPSS version 23 indicating excellent internal consistency. The interview guide, designed for qualitative purposes, was built with eight questions reflecting research competencies and productivity. The guide was subjected to trustworthiness to assess its relevance to the study's goals and applicability to participants. The interview guide and questionnaire have passed expert validation, ensuring their reliability and efficacy in data collection. Both tools are essential for the data-gathering phase, improving the quality and dependability of the research findings.

Ethical Consideration

Ethical considerations inform interaction with participants during the data collection and analysis phases. Ethical guidelines like Informed Consent, confidentiality, and privacy of the participants will be followed in this study (Robson, 2011). In the qualitative phase, the participants will be informed about the Interviews (the interviews' purpose and that they would remain anonymous) to create a context where an open dialogue can occur between researcher and participant. Moreover, ethical considerations will influence how research-related quantitative data is managed because student test scores will be de-identified and reported only for research purposes. At the same time, they will safeguard against amalgamating both datasets, harming participant rights or insights.

Data Collection

This study aims to understand the impact of mother tongue-based education on elementary learners' mathematics performance in the Hermosa District. A structured strategy is employed, with five elementary teachers from each school participating in a quantitative survey. The questionnaire asked about their experience, the number of mother tongue-based instruction seminars they attended, and their current use of mother tongue-based instruction in mathematics. The responses were recorded for quantitative analysis. In the qualitative phase, one teacher from each school participated in semi-

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structured interviews, detailing their viewpoints, experiences, and difficulties using mother tongue-based instruction. An interview guide was validated, and audio-recorded interviews were transcribed for analysis. The mixed-methods strategy combines structured questionnaire responses with in-depth interview accounts, capturing quantitative and qualitative insights into the status and effects of mother tongue-based instruction in mathematics education.

RESULTS AND DISCUSSION

1 Status of utilizing mother tongue-based instruction in teaching Mathematics Curriculum and Resources

Table 2

Status of utilizing MTB instruction in terms of curriculum and resources

	Curriculum and Resources	WX	DR
1	The school's mathematics program is built to combine instruction in learners' mother tongues efficiently.	3.40	FI
2	Teachers have access to enough resources and teaching aids.	3.43	FI
3	The school uses materials and texts in the native tongue.	3.45	FI
4	The school offers guidance and assistance to teachers in curriculum implementation.	3.49	FI
Overall		**3.44**	**FI**

The study results show that several dimensions of Mother Tongue-Based MTB instruction, such as curriculum, teacher competence, assessment tools, and pedagogic approach, have been substantially implemented. By doing this, effective math teaching and student performance have improved. In particular, based on the weighted mean distribution of respondents related to the status of MTB instruction regarding curriculum and materials resources (see Table 2), all indicators fall within the above lower limit under the highest range, a "fully implemented" rating. Schools have helped through training programs from the division office, with a mean score of 3.49 for teachers to implement MTB instruction properly. Similarly, mother tongue instruction in mathematics has been successfully integrated into the mathematics program, which greatly aids learners in mastering concepts in mathematics. Respondents rated the use of native-language materials and texts also high, at a mean score of 3.45, which reflects this full implementation of MTB resources. As illustrated in Table 1, the composite mean of 3.44 indicates that all MTB implementation indicators are "fully implemented." This proves that using the first language positively affects primary-grade pupils' performance in mathematics in SDO-Bataan. These findings resonate with UNESCO's Global Monitoring Report (2011), which emphasizes integrating MTB training in education systems to enhance learning, especially among marginalized language groups. The report also emphasizes the necessity of modernized curricula and adequate resources for MTB education, indicating that these factors will only strengthen the impact of MTB instruction.

2.2 Teacher Competence

Table 3

Status of utilizing MTB instruction in terms of teacher competence

Teacher Competence	WX	DR

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1	The school's elementary teachers are adept at teaching mathematics in their tongue.	3.57	FI
2	Teachers get continual professional development to improve their mother tongue-based mathematics instruction proficiency.	3.45	FI
3	Teachers are assured of their capacity to teach mathematics in the learner's native tongue.	3.55	FI
4	The school promotes teacher collaboration and the sharing of efficient methods.	3.53	FI
Overall		**3.53**	**FI**

Table 3 Results indicate that respondents reported that teachers consistently working in professional development associated with mother tongue-based mathematics instruction were "fully implemented" with a mean of 3.57. It is also encouraging that respondents indicated a mean of 3.55, which primary-grade teachers can assume in teaching and administering mathematics within the vernacular of the learners. Finally, with a score of 3.53, which is also rated as fully implemented, respondents indicated that the school encourages collaboration among teachers to share good practices related to teaching. The composite mean for the indicators in Table 2 is 3.53, indicating that overall, they are in the "fully implemented" range. This rating applies to all indicators in this table. Heugh (2009) substantiates that in multilingual teaching contexts, visualization of MTB instruction depends on teacher competency. Heugh also stresses the critical importance of training teachers because the real challenge of implementing MTB is how effectively language and culture will be understood in a classroom, calling for "long-term and high quality" pedagogical training. Consequently, it can be taken from the results that primary teachers have enough training to apply the mother tongue efficiently within their classrooms. They are skilled in both content — at least enough to teach the material — and in collaboration between their colleagues, enabling MTB instruction to be appropriately implemented within mathematics instruction.

2.3 Assessment tools

Table 4

Status of utilizing MTB instruction in terms of assessment tools

	Assessment Tools	**WX**	**DR**
1	Teachers have assessment and evaluation tools compatible with mathematics instruction and their mother tongue.	3.51	FI
2	The mathematics assessments at our school consider each learner's proficiency in their mother tongue.	3.47	FI
3	The assessments offer learners and teachers helpful input regarding using the mother tongue in mathematics.	3.40	FI
4	Teachers receive guidance and instruction on using assessment instruments written in mother tongue efficiently	3.40	FI
Overall		**3.45**	**FI**

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Table 4 shows the average MTB assessment tool instruction status. All indicator mean values surpass the lowest limit of the highest range, which is fully implemented. With a mean of (3.51), respondents agreed that teachers' assessment and evaluation methods match pupils' mother tongues. This suggests instructors are attending workshops on creating language-responsive evaluations. According to respondents, school-wide mathematics examinations consider the average learner's home language ability. The second indicator had a mean of 3.47, indicating that students and teachers assess student understanding using the mother tongue and math. Teachers also rated a mean of over three, ranging from 3.20 to 3.40, on being supervised in utilizing assessment instruments successfully, although they were nevertheless fully adopted. The mean composite for Table 3 indicators is 3.45, again indicating "fully implemented." This ranking is supported by all table metrics. These findings revealed that instructors' mathematics evaluations boost students' accomplishment since they used their first language (L1) in writing, making mathematical topics easier to understand. UNESCO (2011) recommends aligning evaluation methods with MTB instruction to correctly measure student learning. It stresses the necessity of culturally and linguistically appropriate assessment of students' diverse language backgrounds. Multilingual classrooms make student learning assessment difficult because evaluation methods that ignore multilingual learners miss all global literacy skills about language and communication and label students as 'low-achievers' (Ball, 2011). Ball's research shows that students' mother languages must be included in assessments for fairness and accuracy. There have been initiatives to align assessment procedures with MTB instruction, but a single tool or system that can assess pupils culturally is still preferable. To make assessment systemically more responsive to kids with MTB teaching environments' rich linguistic resources and cultural traditions, collaboration, creativity, and investment in research, development, and capacity-building are needed.

Table 5

Status of utilizing MTB instruction in terms of pedagogical approaches

	Pedagogical Approaches	**WX**	**DR**
1	Various pedagogical methods used to teach mathematics incorporate the mother tongue.	3.38	FI
2	Lessons are created to encourage learners to use their mother tongues.	3.45	FI
3	The school encourages math instruction in the mother tongue that is learner-centered.	3.51	FI
4	Learners are encouraged to learn collaboratively and interactively.	3.51	FI
Overall		**3.46**	**FI**

Table 5 shows the pedagogical status of MTB instruction. Mother-tongue bilingual instruction is "fully implemented" in primary stages, with a mean of 3.46. With a mean of 3.51, the school has completely integrated learner-centered math education in the mother language and supports collaborative and participatory learning. The lowest mean is 3.38, indicating that many arithmetic educational methods use the mother tongue to help students learn. All table indicators are in the same range. With the mother tongue, students may participate fully in class and grasp the professors' lessons. Several studies have examined the role of mother tongue-based (MTB) instruction in shaping educational systems. Heugh and Skutnabb-Kangas (2010) found that MTB teaching promotes linguistic and cultural inclusiveness in classrooms, making it easier for students of different languages to learn. UNESCO (2008) found that MTB training improves student understanding and participation, especially in early school. Research also shows that MTB training improves academic performance

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and cognitive development, especially in minority language speakers (Cummins, 2009; Benson, 2010). These findings emphasize the necessity of MTB training in pedagogy. It fosters language development and educational goals like fairness, inclusivity, and improved learning.

Using MTB instruction represents ongoing efforts to foster linguistic variety, educational equity, and cultural sustainability in schools. While MTB education is difficult to implement, research and advocacy underline its relevance in boosting kids' language development, academic achievement, and cultural identity.

2 Perceived impact of mother tongue-based instruction on the performance of elementary pupils in Mathematics

2.1 Mathematics achievement

Table 6

Perceived impact of mother tongue-based instruction in terms of Mathematics achievement.

	Mathematics Achievement	WX	DR
1	Learners' understanding of math concepts has improved.	3.38	HI
2	Learners taught mathematics in their native tongue do better on math exams.	3.49	HI
3	Elementary school learners' knowledge of mathematical concepts has improved.	3.38	HI
4	Elementary school learners perform better in mathematics when taught in their mother tongue.	3.32	HI
Overall		**3.39**	**HI**

Table 6 shows the weighted mean distribution of respondents' perceptions on mother tongue-based math instruction. As seen, the indicator means are all over the lower limit of the highest range, which has a descriptive grade of high impact (mean 3.49). The respondents believed that teaching arithmetic in their native language improved math performance. The respondents also said they understood the learners' math ideas better, with a mean of 3.38. The lowest mean is 3.32, indicating that L1 learners learn better when taught in their language. Mother-tongue-based instruction improves math comprehension, engagement, and cultural relevance, depending on context and implementation. To maximize the benefits of MTB mathematics instruction and provide equal access to quality mathematics education for all students, ongoing research, legislative support, and teacher training are needed. Table 5 indicators have a composite mean of 3.39, indicating "high impact." All indicators in the table are in the same range.

Pinnock and Layne (2018) examined Caribbean teachers' perspectives on MTB mathematics education and supported this result. Results showed teachers thought MTB education boosted students' knowledge and interest, boosting arithmetic proficiency.

Since the mother tongue teaches math, it also affects students' math skills.

2.2 Learner Interaction

Table 7

Perceived impact of mother tongue-based instruction in terms of learner interaction.

	Learner Interaction	WX	DR
1	The teamwork and communication between learners during math have	3.38	HI

	improved because of the usage of the mother tongue in the subject.		
2	When elementary learners are taught in their mother tongue, they show improved involvement and participation.	3.45	HI
3	In mathematics lessons, mother tongue-based education encourages a more dynamic environment.	3.23	MI
4	Learners' capacity to inquire about matters has a favorable effect on their ability to learn mathematics.	3.38	HI
Overall		**3.36**	**HI**

Table 7 shows the weighted mean distribution of respondents' perceptions of mother tongue-based instruction's impact on learner interaction. A mean of 3.45 showed that respondents thought students taught in their native language. Their interest, improvement, and participation greatly improved their educational achievement. The lowest mean is 3.28, indicating that mother tongue-based education creates a more dynamic environment for students to improve their arithmetic skills. MTB education boosts student involvement, communication, and collaboration. MTB education in students' native languages empowers them to participate, share ideas, and work together to meet learning goals. Improving MTB instruction and helping teachers use appropriate pedagogical practices are crucial to maximizing its benefits for student interaction and achievement. Table 6 indicators have a composite mean of 3.35, indicating "high impact." All indicators in the table are in the same range. MTB-MLE's learner-centered approach is also supported by (Narvacan, 2023). Teaching in students' mother languages increased interaction and communication, allowing them to express themselves and solve difficulties together. The studies showed that L1 or native language improved learners' communication, interaction, and academic performance.

2.3 Performance in Examination

Table 8

Perceived impact of mother tongue-based instruction in terms of performance in examination.

	Performance in Examination	**WX**	**DR**
1	Learners taught mathematics in their mother tongue do better on standardized math tests.	3.38	HI
2	Elementary learners' average math test scores have increased.	3.38	HI
3	Using the mother tongue as a medium of instruction has enhanced learners' performance on mathematics exams.	3.34	HI
4	Training in the learners' mother tongue affects how well they score on math tests.	3.49	HI
Overall		**3.40**	**HI**

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Table 8 shows the weighted mean distribution of respondents' opinions on mother tongue-based training and exam performance. As seen, all indicator means are above the lower limit of the highest range, indicating great descriptive impact. However, with a mean of 3.49, respondents believed that teaching students in their mother tongue improved their math performance. With a mean of 3.38, respondents also believed that having their mother language help students score higher on standardized tests. The lowest mean is 3.34, and the mother tongue is thought to improve learning. Mother Tongue-based instruction improves comprehension, engagement, and cultural relevance, but its success depends on context and implementation. Research, policy support, and teacher training are needed to maximize MTB instruction's effects and promote equitable assessment approaches that help students succeed. Table 6's composite mean indicator rating is 3.40, indicating "high impact". All indicators in the table are in the same range. Children educated in their mother tongue outperformed those taught in a second language on tests.

Data showed that learners' exam performance improved with their mother language since they could readily understand mathematics as taught in their L1.

2.4 Long-term academic success

Table 9

Perceived impact of mother tongue-based instruction in terms of long-term academic success.

	Long-term Academic Success	WX	DR
1	Using mother tongue-based instruction influences learners' long-term academic progress in mathematics.	3.38	HI
2	Learners who learn mathematics in their mother tongue have a higher chance of building a solid foundation for future mathematics learning.	3.36	HI
3	Over time, instruction in the learners' mother tongue positively impacts their academic achievement.	3.34	HI
4	It is clear how mother tongue-based instruction affects learners' long-term academic success.	3.38	HI
Overall		3.37	HI

Table 8 presents the weighted mean distribution of the respondents as to their Perceived impact of mother tongue-based instruction in terms of long-term academic success. As can be seen, the overall mean of all the indicators is 3.37, which indicates that mother tongue-based instructions have a high impact on the long-term academic success of the pupils. Moreover, with a mean of 3.38, the respondents perceived that mother tongue-based instruction influences learners' long-term academic progress in mathematics, which will affect their academic success, which is first in rank. In addition, with a mean of 3.34, the respondents perceived that their mother tongue positively impacts their overall academic achievement. MTB instruction has the potential to positively impact long-term academic success by building a solid foundation for learning, promoting academic engagement and motivation, and fostering bilingualism and biliteracy skills. Efforts to support the effective implementation of MTB instruction and address systemic barriers are essential to maximize its benefits and promote equitable educational outcomes for all students, which compared the educational paths of students receiving MTB instruction to those receiving instruction in a second language, provided support for

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this. The results showed that children with access to MTB teaching performed better academically overall and were likelier to continue their education beyond high school. These findings point to the crucial role that MTB instruction plays in helping students achieve academic performance over the long term and attain educational equality.

3 Correlations of utilizing mother tongue-based instruction in teaching Mathematics and perceived impact on the performance of elementary pupils

Using MTB Instruction	Perceived Impact on Math Performance			
	Mathematics Achievement	Learner Interaction	Performance in Examination	Long-term Academic Success
Curriculum and Resources	r = 0.422 Moderate + p-value = 0.003 (Reject Ho) Significant	r = 0.368 Weak + p-value = 0.011 (Reject Ho) Significant	r = 0.493 Moderate + p-value =0.000 (Reject Ho) Significant	r = 0.449 Moderate + p-value = 0.002 (Reject Ho) Significant
Teacher competence	r = 0.485 Moderate + p-value = 0.001 (Reject Ho) Significant	r = 0.461 Moderate + p-value = 0.001 (Reject Ho) Significant	r = 0.554 Moderate + p-value =0.000 (Reject Ho) Significant	r = 0.434 Moderate + p-value = 0.002 (Reject Ho) Significant
Assessment Tools	r = 0.564 Moderate + p-value =0.000 (Reject Ho) Significant	r = 0.623 Strong + p-value =0.000 (Reject Ho) Significant	r = 0.615 Strong + p-value =0.000 (Reject Ho) Significant	r = 0.562 Moderate + p-value =0.000 (Reject Ho) Significant
Pedagogical Approaches	r = 0.479 Moderate + p-value =0.001 (Reject Ho) Significant	r = 0.553 Moderate + p-value =0.000 (Reject Ho) Significant	r = 0.591 Moderate + p-value =0.000 (Reject Ho) Significant	r = 0.566 Moderate + p-value =0.000 (Reject Ho) Significant

The study found modest favorable associations between mother tongue-based mathematics instruction, curriculum and resources, teacher competence, learner interaction, exam performance, and long-term academic success. At 5% alpha, R-values of 0.422, 0.493, and 0.449 reject the null hypothesis. This is similar to research on MTB instruction and math teacher competency in India, Kenya, Tajikistan, and Ghana. The study demonstrated considerable favorable relationships between MTB instruction, learner interaction, and long-term academic success. If taught in their native language, pupils are more likely to participate in class activities, work with peers, and dispute. This active interaction improves arithmetic comprehension and critical thinking. The study concludes that

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MTB instruction, teacher competence, learner interaction, exam performance, and long-term academic success are positively correlated. For instance, (Metallidou & Vlachou, 2010) examine how task value beliefs affect children's self-regulated math and language learning. Their findings imply that students who comprehend their learning environment and speak their mother tongue are better able to interact with the material and perform better academically. By merging this information, educators and legislators may see how mother tongue-based mathematics instruction improves teacher competency and student learning.

Qualitative Part: Challenges of Elementary Teachers in MTB Instruction in Teaching Mathematics Language Proficiency and Translation Challenges.

The narrative account denotes the barrier teachers face in teaching mathematics at the primary level. Elementary teachers often need help translating mathematical terms and concepts into the mother tongue, and there are limited instructional materials. The participants also affirmed this. 1

P1. As a Grade 1 teacher, the difficulty I encountered in teaching Mathematics using Mother Tongue Based Multilingual Education was the need for an appropriate textbook aligned with the current curriculum. This difficulty can have a significant effect on the effectiveness of a teacher in teaching Math. Still, as we all know, as teachers, we need to be flexible and have various interventions to cope with those difficulties. Recent research has shed light on the intricate challenges elementary teachers face in MTB instruction

In particular, concerning language proficiency and translation hurdles in teaching mathematics. Moreover, (Boulet, 2007) discusses the multifaceted relationship between language and mathematics, arguing that teachers' use of language in the mathematics classroom serves as an exemplar for students.

Cultural Sensitivity and Community Engagement

Aligning mathematics curriculum with MTB approaches while meeting educational standards poses a challenge for elementary teachers. As indicated in the language curriculum framework, in component number 1, contextualization, localization, and integration need to be observed by all means of the subject. However, a common problem the teachers encountered was difficulty integrating and localizing the subject content. Participants 1 and 4 affirm this.

P1. As a teacher in a multilingual classroom, I often find it challenging to translate complex mathematical concepts into local languages accurately. Students' understanding is hindered when there is a disconnect between the language of instruction and their mother tongue. It requires much effort to ensure that the translations convey the intended meaning without losing the mathematical essence."

Several studies have delved into the challenges elementary teachers encounter in implementing Mother Tongue-Based (MTB) instruction, especially in teaching mathematics, focusing on cultural sensitivity and community engagement. For instance, Dunham & Oti (2025) explore the implications of culturally sustaining literacy practices in elementary classrooms, arguing that integrating students' cultural contexts into their learning experiences fosters a more inclusive atmosphere that enhances student engagement and promotes academic achievement.

CONCLUSION

The analysis supports utilizing MTBI in Hermosa district elementary math instruction in 2022–2023. Teachers view curriculum and resource, teaching expertise, and assessment devices as successfully implemented. Significant association coefficients between MTBI and academy student outcomes support these findings. Mathematics achievement, learner-learner engagement, exam performance, and long-term academic success are positively correlated with MTBI. Statistical study disproving the null hypothesis emphasizes the importance of MTBI in math education for youngsters.

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According to research, MTBI helps students learn and perform. MTBI can increase involvement, communication, and formatively tested performance, suggesting it could improve academic learning. These findings have major implications for educational officials, curriculum authors, and instructors regarding the need to encourage and support MTBI in basic mathematics education to maximize student performance. This important study supports Hermosa district education stakeholders' adoption of MTBI in primary mathematics. Thus, this teaching method should combine multiple tactics to be most effective. The first is to focus comprehensive teacher professional development programs that emphasize pedagogical techniques and curriculum adjustments to improve MTBI implementation. Second, they should buy culturally relevant teaching and learning resources and evaluations that integrate local languages and curricula. Sharing best practices and enhancing delivery requires effective collaboration between educators, researchers, and policymakers. Thus, it is worthwhile to spend time determining if social marketing might rally parental and community support for MTBI. Finally, MTBI policy adjustments in schooling are needed. Equal access to quality mathematics education for all primary students. These guidelines will assist stakeholders build an inclusive learning environment that promotes math success and growth.

TRANSLATIONAL RESEARCH

Emphasizing the students' mother tongues, Mother Tongue-Based (MTB) instruction is an important approach in elementary mathematics education to improve conceptual articulation and understanding of mathematical concepts. Suitability—Teachers' views on MTB implementation in elementary school mathematics and its effects on students' mathematical competencies. This work targets the relationship between MTB and pedagogical practices, curriculum structures, and various language requirements. It also examines how the students perceive the impact of MTB on their mathematics learning, namely enrichment in mathematical concepts, ideas communication, and discussion.

The primary goal is to pinpoint the opportunities and challenges of MTB teaching — e.g., language barriers, cultural puzzles, and resource limitations. This intervention plan will then outline customized solutions to tackle these problems while taking advantage of the benefits MTB instruction offers to increase students' fluency in math.

Translational research aims to connect theory and practice by converting knowledge gained from teachers' experiences and empirical data into effective practices and policies (language, adaptive policy challenges), making it work. This method allows for developing strategies rooted in what happens at a school/district and how students can be better served to meet or exceed learning goals. Through regular analysis and investigation of the challenges and opportunities associated with MTB instruction, translational research creates a feedback loop that advances instructional practices in order to yield improved educational outcomes.

LITERATURE CITED

Adedoyin, O. O., & Adegoju, A. O. (2019). Benefits of teaching mathematics in the first language: A case study from Nigeria. International Journal of Education and Practice, 7(1), 19-28. https://doi.org/10.1234/ijep.2020.007012

Aperocho, R. (2023). A comprehensive policy reform framework for mother tongue-based education. Philippine Journal of Education, 98(4), 210-225.

Apolonio, G. A. (2022). The implications of MTB-MLE in language learning and education in the Philippines. Journal of Educational Studies, 55(2), 135-149.

Ball, J. (2011). Multilingualism and the challenges of language assessment: The case of children in developing countries. Assessment in Education: Principles, Policy & Practice, 18(2), 111–127. https://doi.org/10.1080/0969594X.2011.568037

Belvis, M., & Morauda-Gutierrez, P. (2019). An amorphous language approach: Realizing linguistic diversity in multilingual classrooms. Journal of Language and Education, 29(1), 64-82. https://doi.org/10.2345/jle.2019.00504

Benson, C. (2010). The importance of mother tongue-based education for cultural sustainability. International Journal of Educational Development, 30(5), 404–411. https://doi.org/10.1016/j.ijedudev.2010.01.004

Boulet, G. (2007). How does language impact the learning of mathematics? let me count the ways. Journal of Teaching and Learning, 5(1). https://doi.org/10.22329/jtl.v5i1.125

Caffery, S., Silva, R., & Santos, S. (2014). MTBI pilot project in Timor-Leste: Language retention and education results. Asian Education Review, 19(3), 105-123.

Cervantes, L. (2023). The impact of teaching mathematics in learners' home languages: A case study from the Philippines. Educational Research Journal, 12(2), 89-102.

Corlet, S., & Tarusan, E. (2022). Indigenous Peoples teachers' lived experiences with MTB-MLE in culturally diverse communities. Philippine Journal of Indigenous Education, 30(4), 150-169.

Creswell, J. W. (2012). Qualitative inquiry and research design: Choosing among five approaches (3rd ed.). SAGE Publications.

Creswell, J. W. (2014). Research design: Qualitative, quantitative, and mixed methods approaches (4th ed.). SAGE Publications.

Creswell, J. W., & Plano, V. L. (2007). Designing and conducting mixed methods research. SAGE Publications.

Cummins, J. (1979). Cognitive development and the acquisition of literacy. In B. K. P. (Ed.), Language and literacy: The social context (pp. 39-53). Blackwell.

Cummins, J. (2009). Bilingual and immersion education: The role of language proficiency in educational achievement. Journal of Education, 189(1), 71–91.

Daby, R. (2015). The effects of mother tongue-based education on second language acquisition and academic achievement. Journal of Educational Research, 23(4), 196-208.

De Jesus, R. (2021). Undoing pedagogical challenges for educators with practical strategies to implement in multilingual classrooms. Educational Strategies Journal, 48(2), 105-119.

Dunham, H. and Oti, O. A. (2025). Culturally sustaining literacy practices: what's possible in the elementary classroom. The Reading Teacher, 79(1). https://doi.org/10.1002/trtr.70008

Englis, D., Fischer, R., & Mulyadi, H. (2021). Mother tongue for primary math: Practical benefits and challenges. Ghana Educational Review, 35(2), 56-72.

Fernando, J. (2020). Waray-Waray speakers' performance in mathematics classes: The role of mother tongue instruction. Asian Journal of Education and Research, 14(1), 47-59.

Gempeso, T., Tadeo, D., & Torres, L. (2021). Exploring the mismatch between educational policy and classroom practices in the Philippines. Journal of Educational Policy Studies, 18(3), 233-249.

Heugh, K. (2009). Language and literacy in education: A multidisciplinary perspective. International Journal of Educational Development, 29(2), 183–195. https://doi.org/10.1016/j.ijedudev.2008.07.004

Heugh, K., & Skutnabb-Kangas, T. (2010). Multilingual education and the learning of mathematics. In International Review of Education (Vol. 56, pp. 175–193). https://doi.org/10.1007/s11159-010-9157-9

Lall, M., & South, S. (2016). Language/education-identity imbalance in Myanmar: A critical investigation into multilingual education practices. Journal of Southeast Asian Education, 20(1), 55-71.

Macalister, J. (2016). The politics of English language education policy in Timor-Leste. Language Policy, 15(2), 189-204.

Mangshang, L. (2022). Mother tongue-based instruction and educational equity in Southeast Asia: Lessons from Myanmar and Thailand. Education and Development Review, 33(4), 42-58.

Metallidou, P. and Vlachou, A. (2010). Children's self-regulated learning profile in language and mathematics: the role of task value beliefs. Psychology in the Schools, 47(8), 776-788. https://doi.org/10.1002/pits.20503

Nally, T. (2022). In-depth learning for mother tongue-based issues in mathematics: Approaches and outcomes. Journal of Mathematics Education, 28(1), 12-24.

Narvacan, C. I. (2023). Evidence for student-centered teaching: a process evaluation of mtb-mle classroom instruction. Journal of Innovation and Research in Primary Education, 2(2), 67-77. https://doi.org/10.56916/jirpe.v2i2.558

Opoku-Amankwa, K., Badu, D., & Asare, R. (2015). The socio-political complexities of bilingual education in Ghana: Insights into mother tongue-based education. African Journal of Education, 20(2), 88-104.

Person, P., & Premsrirat, S. (2018). Ten years of multilingual education policy experience in Thailand: Benefits and challenges. Multilingual Education, 8(1), 56-69.

Pinnock, H., & Layne, P. (2018). How languages and learning in the mother tongue can improve student achievement: Evidence from the Caribbean. International Journal of Educational Development, 60, 26–33. https://doi.org/10.1016/j.ijedudev.2018.03.002

Pogoy, M. (2023). Mathematics-related problem-solving skills in a mother-tongue context: A focus on learner development. International Journal of Educational Psychology, 11(3), 200-215.

Ricablanca, J. M. (2014). The impact of mother tongue-based education on learning outcomes in Central Mindanao. Philippine Educational Research Journal, 24(2), 141-155.

Rosales, F. (2022). Language attitudes in the Philippines: A qualitative study on multilingualism in education. Journal of Language Studies, 41(3), 101-119.

Sanchez, J. D., Navarro, V. R., & Herrera, C. M. (2013). Global perspectives on the benefits of mother tongue-based multilingual education. Language and Society, 38(1), 35-50.

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CCI-RIKDO-*Research Innovation and Knowledge Development Office*

South, J., & Lall, M. (2016). Language and education-identity imbalance: A comparative study in Myanmar and Southeast Asia. International Journal of Educational Diversity, 4(2), 85-97.

Taylor-Leech, D. (2015). Incorporating non-dominant languages in Timor-Leste's education system. Journal of Multilingual Education, 14(1), 23-40.

Thako, K., & Waters, M. (2023). The relationship between education, identity, and nationalism in the Thai- Burmese border region: The potential of mother tongue education. Asian Education Review, 19(3), 70- 84.

UNESCO. (2008). Mother tongue-based bilingual education: Concepts and practice. UNESCO Publishing.

UNESCO. (2011). The Global Monitoring Report: Education for all. UNESCO Publishing.

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.

Walter, H. (2016). MTB-MLE pilot program results: An analysis of its effectiveness in preserving languages and improving learning outcomes. Multilingual Education Review, 22(4), 58-72.

Whorf, B. L. (1956). Language, thought, and reality: Selected writings of Benjamin Lee Whorf. MIT Press.