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Impact of Mother Tongue- Based Multilingual Education (Mtb-Mle) on Numeracy Skills Development Among Key Stage 1 Learners

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Abstract

This phenomenological study examined the impact of Mother Tongue-Based Multilingual Education (MTB-MLE) on numeracy skill development among Key Stage 1 learners at Sorsogon Pilot Elementary School (SPES). Using purposive sampling, 14 teachers participated in semi-structured interviews to share their experiences, challenges, and strategies in teaching mathematics through MTB-MLE. The data, analyzed thematically, revealed that MTB-MLE generally improves pupils' understanding and engagement in numeracy by utilizing their native languages. However, challenges such as translating mathematical terminology, learners' varied language proficiency, and limited familiarity with local number words hinder its effectiveness.

Teachers employ strategies like differentiated instruction, real-life examples, manipulatives, and visual aids to contextualize and localize numeracy instruction. They highlight the importance of assessment in tracking learner progress, evaluating instructional strategies, and addressing individual learning needs. Despite these efforts, translation difficulties and resource limitations underscored the complexities of integrating MTB-MLE into mathematics instruction.

The study concluded that while MTB-MLE positively influences numeracy, its potential is limited by translation challenges and the lack of targeted teacher support. An enhanced MTB-MLE program was proposed to address these issues and improve outcomes. Recommendations include teacher training, workshops for effective translation of mathematical terms, technical assistance in diverse assessment strategies, and establishing school-based support systems. Future studies are suggested to explore comparative instructional methods, pupils' perceptions, parental involvement, and the integration of technology in MTB-MLE mathematics instruction. These insights aim to strengthen the implementation of MTB-MLE and enhance numeracy development among Key Stage 1 learners.

Keywords: Mother Tongue-Based Multilingual Education (MTB-MLE), Numeracy skill development, Key Stage 1 learners

CHAPTER I
THE PROBLEM AND ITS SETTING

Introduction

Mother tongue instruction in early childhood education is essential for fostering children's cognitive, linguistic, and social development. Teaching in a child's native language enhances comprehension and engagement, providing a solid foundation for future learning. It also promotes a sense of identity and

belonging by connecting children with their cultural heritage. By prioritizing mother tongue instruction, teachers created an inclusive environment that support diverse learners, ultimately improving academic outcomes for all learners.

Just as instruction in a child's native language enhanced literacy skills, it also significantly contribute to the development of numeracy skills. Using the mother tongue is essential for developing numeracy skills, as children are better able to grasp mathematical concepts in a language they fully understood. Teaching basic mathematical concepts—such as numbers, operations, and other foundational ideas—through the mother tongue establishes a solid foundation for learning higher-level mathematics (Esuong, 2024). This approach not only enhance comprehension but also foster greater confidence and engagement in mathematical learning. When mathematical concepts are presented in a language that children were fluent in, they are more likely to comprehend and master these ideas effectively. This foundational understanding is crucial for their overall academic success and cognitive growth. Fostering numeracy development through native language instruction is vital for ensuring equitable access to education, especially for children from linguistically diverse backgrounds. By addressing language barriers in the early stages of learning, educational systems create a more inclusive environment that nurture the cognitive development of all learners, ultimately improving their academic outcomes.

In early childhood education, where numeracy skills were first introduced, using the native language helped bridge the gap between a child's everyday experiences and formal mathematical concepts. It allowed children to engage with mathematical ideas using familiar vocabulary and contextual examples, making it easier for them to comprehend abstract concepts such as counting, addition, and subtraction. This approach aligned with research indicating that children's cognitive skills were better developed when they learned in their first language, as it reduced cognitive load and promoted active participation

The statistics provided by UNESCO highlight a significant global issue: approximately 221 million children around the world speak a different language at home than the one used for instruction in their schools. This linguistic mismatch can lead to substantial educational inequalities, particularly in early childhood education. Children who are not taught in their native language may struggle to understand lessons, resulting in gaps in their learning and academic performance. Furthermore, this situation can create feelings of stigma and marginalization among these children, as they may feel excluded from the educational process and may not fully engage with their peers and teachers.

To counteract these challenges, an increasing number of countries in Asia have begun to adopt multilingual education policies that prioritize the use of native languages in the classroom. According to Malone (2018), such initiatives are designed to foster inclusivity and ensure that all children have equitable access to quality education, regardless of their linguistic background. The underlying theory is that learning in a child's native language during the early grades can enhance cognitive skill development, making it easier for them to acquire additional languages later on. This approach is supported by Argaw (2016), who suggests that proficiency in a native language can bolster the learning of a second language and help children transfer the cognitive skills they develop in their first language to their second.

However, despite the theoretical benefits of mother-tongue education, research from countries like Kenya and Ethiopia indicates that the outcomes of such policies are not uniformly positive. As noted by Piper et al. (2016), evidence from these contexts reveals mixed results regarding the effectiveness of mother-tongue instruction on literacy and proficiency in the second language. This suggests that while there are potential advantages to using native languages in education, the actual implementation and outcomes can vary significantly based on numerous factors, such as the quality of teaching, resources

available, and the specific educational context. Thus, while multilingual education policies offer a promising pathway to improve learning outcomes, they require careful planning and execution to be truly effective.

Numeracy, which combined mathematical knowledge, problem-solving abilities, and communication skills, was essential for success in a technological world. Developing numeracy skills in primary grades laid the foundation for future learning, enhanced everyday life skills, and supported cognitive development. It fostered critical thinking and problem-solving abilities, contributing to higher academic achievement across subjects. Strong numeracy skills were crucial for economic and career opportunities in a data-driven world and built children's confidence and motivation in their academic abilities. Additionally, ensuring all children developed these skills promoted educational equity, provided equal opportunities, and helped bridge achievement gaps.

UNRWA (2013) defined numeracy as the confidence and competence to proficiently handle numbers and measurements. Mathematics was often perceived as difficult by many learners, yet it was a basic and crucial knowledge underpinning logical thinking, problem-solving, and the ability to understand and apply concepts in science, technology, and everyday life. Achieving proficiency in basic skills fostered critical thinking, analytical abilities, and overall academic performance, and prepared learners for standardized tests and real-life applications. Mastering fundamental math operations and problem-solving skills in elementary grades was vital, as it laid the foundation for more complex mathematical concepts encountered in higher grades, such as algebra and calculus. Unfortunately, the performance of learners in mathematics across the globe seemed to need intervention in some countries as the results of standardized examinations were low.

Since its establishment in 1995, TIMSS (Trends in International Mathematics and Science Study) provided a comprehensive assessment of global mathematics and science achievement every four years. The latest TIMSS in 2019 surveyed fourth and eighth-grade learners across 64 countries and 8 benchmarking systems, encompassing a total of 580,000 participants. In fourth-grade mathematics, countries in East Asia such as Singapore, Hong Kong SAR, and Korea emerged as top performers, with Singapore leading the group with a score of 625. European nations like the Russian Federation and Northern Ireland also demonstrated strong performances but lagged behind the global leader. Portugal notably showed significant progress since 1995, achieving an 83-point increase, equivalent to nearly two years' worth of learning. In eighth-grade mathematics, East Asian countries once again dominated, with Singapore leading with 608 points. Countries like Turkey showed notable improvement, recording a 38-point gain since 2015, reflecting substantial advancements in mathematical proficiency.

The Organisation for Economic Co-operation and Development (OECD) oversaw the Programme for International Student Assessment (PISA), which assessed the proficiency of 15-year-olds in reading, mathematics, and science for practical applications in real life. PISA evaluates learners' mathematical proficiency by measuring their ability to apply, interpret, and use mathematics across various contexts, ranging from personal experiences to broader and more abstract scenarios involving work, society, and scientific concepts. Strong mathematics proficiency, as defined by OECD (2019), enabled learners to reason mathematically and utilize mathematical concepts, procedures, facts, and tools to describe, explain, and predict phenomena.

In the 2022 PISA assessment, significant disparities in performance were observed across ASEAN Member States (AMS). Singapore led globally with an average score of 559, while Cambodia ranked lowest with an average score of 337. Except for Singapore, all AMS scored below the OECD

average across all three competency areas, highlighting the region's need for comprehensive improvement. In the Philippines, only 16% of learners attained at least Level 2 proficiency in mathematics, which signified the ability to independently interpret and apply mathematics in straightforward situations, such as comparing distances or converting currencies. This figure contrasted entirely with the OECD average of 69%. In contrast, more than 85% of learners in Singapore, Macao, Japan, Hong Kong, Chinese Taipei, and Estonia achieved at least Level 2 proficiency or higher.

The Philippines had nearly no learners classified as top performers in mathematics, defined as those who attained Level 5 or 6 in the PISA mathematics test, while the OECD average was 9%. Six Asian countries and economies excelled in this regard: Singapore (41%), Chinese Taipei (32%), Macao (29%), Hong Kong (27%), Japan (23%), and Korea (23%). At these highest levels, learners could adeptly model complex situations mathematically and discern, compare, and assess appropriate problem-solving strategies. Remarkably, only 16 of the 81 countries and economies participating in PISA 2022 saw more than 10% of learners achieve Level 5 or 6 proficiency. The Philippines placed 77th out of 81 countries, scoring well below the global averages: 355 in mathematics, 347 in reading, and 373 in science. Specifically, the Philippines ranked third lowest in science, sixth lowest in reading, and sixth lowest in mathematics. These results highlighted the urgent imperative to enhance educational outcomes for greater international competitiveness (Montemayor, 2023).

Many initiatives has been undertaken in education to ensure that learners effectively absorbed and comprehended mathematical instruction. One effective strategy involved employing the learner's mother tongue as the primary medium of instruction. Supporters of mother-tongue-based education argued that using the learner's mother tongue as the primary medium of instruction in education was an effective strategy that enhanced understanding and engagement across subjects, particularly in Mathematics. It enabled learners to grasp complex concepts more easily by utilizing a language familiar to them, thereby promoting deeper comprehension. This approach fostered active participation and confidence among learners, encouraging them to express themselves and collaborate effectively in learning environments.

Consider rural primary school learners who faced the daunting challenge of learning mathematics in a language they did not understand during their upper primary school years. This language barrier led to confusion, disinterest, and boredom among learners. According to current language of instruction (LOI) policies in Ghana, Ghanaian Language (L1) and English (L2) were used from Kindergarten to Lower Primary, while only English was used from Primary four onwards (Ansah, 2014). Consequently, teachers had to deliver mathematics lessons exclusively in English starting from primary four. This policy presented a considerable challenge, particularly in rural areas where English language proficiency among learners was often limited. The transition to English as the sole medium of instruction hindered effective mathematics education. The policy exacerbated existing disparities in educational outcomes between urban and rural schools, where access to quality English language instruction and resources was more limited. Addressing these challenges required thoughtful strategies to support both learners and teachers in rural areas to improve English language proficiency while ensuring effective mathematics instruction.

In the Philippine educational system, the recently implemented K to 12 curriculum integrated the use of the mother tongue as a medium of instruction for grades 1 to 3, taking into account the country's linguistic diversity with its 180 local languages (Parba, 2018). Mother tongue was utilized to teach all subjects related to literacy, including Mathematics, Araling Panlipunan (AP), Music, Arts, Physical Education and Health (MAPEH), and Edukasyon sa Pagpapakatao (EsP) during these early grades. Teachers often cited

these subjects as naturally suited for instruction in the mother tongue due to their content's adaptability to local contexts (Pillos, et al., 2020). However, complications arose, especially in Mathematics, where learners often confronted significant challenges in comprehending essential concepts and skills. These difficulties were particularly pronounced during problem-solving tasks, which were fundamental to the subject. Problem-solving in Mathematics requires not only numerical proficiency but also the ability to interpret and manipulate language effectively. Language played a critical role in how learners approached and understood mathematical word problems, as these problems often required translating real-world situations into mathematical expressions or equations.

Public elementary schools in the Philippines faced the mandate of using the mother tongue as the medium of instruction for teaching Mathematics at primary levels. This policy aimed to enhance learning by aligning instruction with learners' linguistic backgrounds and facilitating comprehension. However, despite the Department's efforts, challenges persisted in ensuring effective implementation. Despite extensive teacher training, workshops, and the provision of new learner materials, teachers and learners encountered difficulties. Teachers struggled to effectively convey mathematical concepts using the mother tongue, and learners often faced challenges in understanding specialized mathematical terminology and concepts (Tupas & Martin, 2017; Aliñab et al., 2018). These implementation issues highlighted the complexities involved in integrating language and mathematical instruction effectively within the educational framework.

As a primary-grade mathematics teacher, the researcher observed the challenges faced by teachers in teaching mathematics to learners and noted the varying opinions on the effectiveness of using the mother tongue as a medium of instruction. This qualitative study was conducted to explore teachers' experiences with developing numeracy skills among learners at Sorsogon Pilot Elementary School and to determine whether using the Mother tongue provided advantages in mathematics instruction.

The setting of the Study

Sorsogon City, officially known as the City of Sorsogon, was a 3rd class component city and served as the provincial capital of Sorsogon in the Philippines. Covering an expansive land area of 31,292 hectares (120.82 sq mi), it was recognized as the largest city in the Bicol region by land area and stood as the sole city within the province. Established in 2000 through the merger of Bacon and Sorsogon municipalities, the city encompassed 64 barangays and was established under Republic Act No. 8806, enacted on August 16, 2000, and ratified later that year in December. Sorsogon City was situated at the southernmost tip of the Bicol Peninsula and Luzon Island.

The City Government of Sorsogon was led by Mayor Ma. Ester E. Hamor, supported by Vice Mayor Mark Eric C. Dioneda, the Sangguniang Panlungsod Members, and the City Department Heads. The city was administratively divided into three districts: Bacon District, East District, and West District.

DepEd Schools Division of Sorsogon City was subdivided into four districts: Bacon East, Bacon West, Sorsogon East, and Sorsogon West. The Division was under the leadership of Schools Division Superintendent Jose L. Doncillo, who oversaw a total of 83 public schools. Additionally, there were 19 private and non-DepEd schools offering senior high school education, along with one state university featuring a laboratory high school still under DepEd supervision. This study focused on Sorsogon Pilot Elementary School, the central and largest school in the Sorsogon West District of the Schools.

Figure 1. Map of Sorsogon City Showing the Participant School

Statement of the Problem

This study investigated the perceptions and experiences of key stage 1 mathematics teachers at Sorsogon Pilot Elementary School (SPES) regarding the implementation of Mother Tongue-Based Multilingual Education (MTB-MLE) in numeracy instruction for primary learners. By examining the teachers' lived experiences, the study aimed to address the following questions:

1. How do SPES teachers perceive the impact of Mother Tongue-Based Multilingual Education (MTB-MLE) on numeracy skill development among key stage 1 learners?
2. What strategies do SPES teachers employ to develop numeracy skills using MTB-MLE?
3. What challenges do SPES teachers encounter in developing numeracy skills through MTB-MLE?
4. How do SPES teachers contextualize, translate, and localize numeracy instruction within MTB-MLE?
5. What role do MTB-MLE teachers play in formulating learner assessments to enhance numeracy skills?
6. What enhanced school-based MTB-MLE for Key Stage 1 learners can be proposed to improve their numeracy skills?

Assumptions

This research has the following assumptions:

1. SPES teachers perceived that Mother Tongue-Based Multilingual Education (MTB- -MLE) positively impacted numeracy skill development among primary learners by enhancing understanding, engagement, and retention of mathematical concepts through clear explanations and cultural relevance.

a. 2. SPES teachers employed many strategies, including culturally relevant materials, local language use, real-life examples, and collaborative learning, to develop numeracy skills using Mother Tongue-Based Multilingual Education (MTB-MLE).

2. SPES teachers encountered challenges, including resource limitations in local languages, transitions to English medium, community resistance, and the ongoing need for professional development in language and pedagogy when developing numeracy skills through MTB-MLE.

3. SPES teachers contextualized, translated, and localized numeracy instruction within MTB-MLE by integrating local examples, cultural references, and translated terms to enhance understanding and relevance for learners, fostering deeper engagement in mathematics.
4. MTB-MLE teachers were essential in creating culturally relevant assessments that enhanced numeracy skills by ensuring learners understood mathematical concepts in their mother tongue.
5. An enhanced school-based MTB-MLE program focused on teacher training and the development of contextualized instructional materials could be proposed to improve the numeracy skills of Key Stage 1 learners.

Scope and Delimitation

This study investigated the perceptions and experiences of primary grade mathematics teachers at Sorsogon Pilot Elementary School (SPES) regarding the implementation of Mother Tongue-Based Multilingual Education (MTB-MLE) in numeracy instruction. It explored how these teachers perceived the impact of MTB-MLE on numeracy skill development, identified the strategies they employed to enhance numeracy skills within this framework, and examined the challenges they faced in implementing MTB-MLE. Additionally, the study looked into how teachers contextualized, translated, and localized numeracy instruction and assessed the role of assessment in their efforts to improve numeracy skills.

The research focused exclusively on primary grade teachers at SPES, excluding the school head, non-teaching personnel, teachers in higher grade levels, and those involved in the Special Needs Education Program at SPES. Teachers from other public and private schools within DepEd Sorsogon City Division were also not included. The study did not involve learners directly; it concentrated on the teachers' perceptions and experiences as shared during interviews and did not explore the root causes of challenges or underlying principles beyond the teachers' voluntary responses.

Significance of the Study

This dissertation is deemed beneficial to the Department of Education as a reference or basis for policy recommendations. Specifically, this will be of help to the following:

Department of Education. This dissertation serves as a valuable reference for policy recommendations related to the implementation of Mother Tongue-Based Multilingual Education (MTB-MLE) in numeracy instruction, aiding in curriculum development and educational reforms.

Regional Directors and Assistant RDs. Regional leaders can utilize the findings to inform regional educational policies and initiatives, ensuring alignment with local needs and promoting effective MTB-MLE practices.

Schools Division Superintendents and Assistant SDSs. Division leaders benefit from insights into effective strategies and challenges in implementing MTB-MLE, enabling them to provide targeted support and professional development opportunities for teachers.

Chiefs of the Curriculum Implementation Division (CID). The study offers recommendations for adapting curriculum frameworks to optimize MTB-MLE integration, enhancing coherence and relevance in mathematics education.

Chiefs of the School Governance and Operations Division (SGOD). The SGOD can utilize the results of the study to enhance governance practices that support MTB-MLE implementation, fostering a conducive learning environment.

Mathematics Program and District Supervisors. Mathematics program supervisors and district supervisors can glean valuable insights into innovative teaching methods and assessment practices under MTB-MLE. These insights will enable them to foster ongoing improvements in numeracy instruction across districts and to implement monitoring and evaluation practices effectively.

School Heads. Principals and school administrators may draw guidance from this dissertation on supporting teachers in implementing MTB-MLE effectively, promoting inclusive educational practices and learner achievement in mathematics.

Teachers. They may gain insights into effective strategies for integrating Mother Tongue-Based Multilingual Education (MTB-MLE) in numeracy instruction, improving their pedagogical approaches, and enhancing learner engagement and achievement in mathematics.

Learners. Learners can benefit from improved numeracy skills through MTB-MLE, which enhances their understanding of mathematical concepts and fosters confidence in learning, thereby supporting their overall academic development and future success.

Community. This research is significant to the community as it promotes the effective use of the local language in education, strengthens numeracy skills among young learners, and fosters a deeper connection to their cultural identity.

Future Researchers. This study provides a foundation for future research endeavors exploring the impact of Mother Tongue-Based Multilingual Education (MTB-MLE) on numeracy instruction. It offers a framework for conducting further investigations into effective educational strategies and their implications for improving learning outcomes in diverse linguistic contexts.

Definition of Terms

For a better understanding of the terms used in this study, they are theoretically and operationally defined.

Challenges. The term refers to the difficulties or obstacles encountered by individuals in attaining their objectives. In the context of this study, this refers to the difficulties experienced by teachers in Sorsogon Pilot Elementary School in facilitating teaching and learning mathematics using Mother Tongue-Based Multilingual Education (MTB-MLE) among K Stage 1 learners.

Impact. The term is usually associated with or taken as synonymous with effect or influence. In the context of this study, this refers to the effect of Mother Tongue-Based Multilingual Education (MTB-MLE) on the development of numeracy skills among primary learners.

Key Stage 1. The term 1 refers to the initial grade level bracket in the Department of Education (DepEd) curriculum, covering Kindergarten through Grade 3.

L1. First language, refers to the mother tongue or dominant language spoken by learners at home. In the context of this study, this is primarily Bicol.

L2. The second language is used alongside L1 in educational settings. In this study, is it typically Filipino or English depending on the immediate environment of the learner?

Learning Gap. Disparity or difference in academic achievement. In the context of this study, this is synonymous with the numeracy gap, particularly about poor development of numeracy skills among learners.

LOI. Language of Instruction is the language used by teachers to teach various subjects in schools. This is synonymous with the medium of instruction, which in this case is the mother tongue of the primary graders.

Mother Tongue-Based Multilingual Education (MTB-MLE). It is an approach that uses the learner's mother tongue as a medium of instruction in early education.

Numeracy Skills. Competencies related to understanding and using mathematical concepts, operations, and problem-solving strategies.

Numeracy Skills Development. This refers to enhancing learners' ability to understand and apply mathematical concepts across various contexts. In this study, it specifically focuses on Key Stage 1 learners taught mathematics using the mother tongue.

Program for International Student Assessment (PISA). It is an international assessment that measures 15-year-olds' performance in reading, mathematics, and science.

Trends in International Mathematics and Science Study (TIMSS). It is an international assessment that measures mathematics and science achievement among learners in different countries.

CHAPTER II
REVIEW OF RELATED LITERATURE AND STUDIES

This chapter presents pertinent literature and studies that have been reviewed for their relevance to the present study. To facilitate an effective transition between general concepts, both foreign and local works are organized thematically. The segmentation of cited literature and studies are structured underscoring the role of language in mathematics learning, the challenges in using the mother tongue in instruction, and the strategies that can enhance the integration of MTB MLE in mathematics education. This thematic discussion was done to strategically build the framework for this qualitative study, emphasizing the significance of the research at hand.

The Role of Language in Mathematics Learning

Learners would experience meaningful learning if the language used in teaching facilitates authentic exchanges of ideas between the teacher and the learner. It is particularly important to use a language familiar to learners to enhance their understanding and engagement. It reduces cognitive load, fosters a supportive environment, and encourages active participation and authentic exchanges between teachers and learners.

Alberto et. al. (2016) asserted that the language of instruction plays a crucial role in addressing the learners' familiarity and comprehension of the material. Therefore, selecting a language of instruction that aligns with the learners' linguistic background not only supports better comprehension of the material but also promotes active participation and a more enriching educational experience. In addition, Acharya et al. (2021) mentioned that incorporating local knowledge and resources into teaching can engage learners in meaningful tasks and activities, making lessons more interesting and cognitively accessible. This approach helps learners relate to the material and enhances their overall learning experience.

While English serves as the medium of instruction (MOI) for many school subjects, its effectiveness hinges on learners' mastery of the language, especially if it is not their native tongue. Karikari et al. (2022) discovered that learners' proficiency in English varies depending on the type and location of their school. Learners enrolled in private urban schools often achieve fluency in English as early as primary two, unlike their peers in public schools. Moreover, children attending schools in urban areas tend to attain English proficiency sooner than those in rural areas due to increased exposure to the language.

Dahm & de Angelis (2018) identified that mother tongue literacy plays a crucial role beyond language acquisition; it also enhances mathematical learning. The role of language in mathematics learning significantly enhances mathematics lessons. Research by Ercikan et al. (2015) across Australia, Canada, the United Kingdom, and the United States highlighted a clear link between proficiency in language and achievement in mathematics.

On a global scale, classrooms often use the mother tongue as the medium of instruction, which is the first or home language for learners. Espada (2012), cited in Patalinghug (2018), argued that many developed countries prioritize using the first language in education. Burton, 2013) also affirmed that the use of the home language as the medium of instruction in classrooms is becoming increasingly prevalent worldwide. According to Espada (2012), mathematics poses challenges for both children and adults due to the complexity of grasping mathematical concepts. However, when the mother tongue is used in the learning process, learners find it easier to acquire fundamental mathematical concepts and skills.

The National Policy on Education (NPE) of the Government of India emphasizes the importance of children learning their mother tongue or the language of their immediate environment (Indriani, et al., 2019). Oluwole (2008) as cited in Umar (2018), defined the mother tongue as the language acquired by a group of people who are considered inhabitants of an area during their early years. Several studies indicate that using the first language in the classroom motivates learners to engage more effectively with their lessons. Researchers argue that neglecting the development of language skills in the mother tongue has contributed to failures within the education system, particularly at the undergraduate level. This underscores the importance of integrating Mother Tongue-Based Multi-Lingual Education (MTB-MLE) into the educational system.

The discussions of Alberto et al. and Acharya et al. highlight that teaching in learners' native language significantly enhances comprehension, engagement, and the relatability of lessons. This aligns with the present study, which emphasizes the value of MTB-MLE in improving numeracy skills among Key Stage 1 learners. Dahm & de Angelis and Ercikan et al. further underscore the positive correlation between mother tongue literacy and improved mathematical performance, supporting the study's focus on how MTB-MLE strengthens numeracy outcomes. Additionally, the work of Espada and Karikari et al. affirms that using the home language simplifies complex subjects like mathematics, particularly in linguistically diverse and rural contexts. These findings closely relate to the present study by reinforcing the role of MTB-MLE in facilitating understanding and making mathematics more accessible to learners at Sorsogon Pilot Elementary School.

Lopez, cited by Magsombol (2021), explained that Mother Tongue-Based Multilingual Education (MTB-MLE) involves using multiple languages for literacy and instruction. It begins by building on learners' existing knowledge and skills. This approach entails learning to speak, read, write, and think in their first language or L1, such as Bicol or Bicolano, while also teaching subjects like mathematics, science, health, and social studies in the same language. In Magsombol's (2021) study, it was found that using the mother tongue effectively enhances learning outcomes. Therefore, incorporating word problems in the mother tongue can be implemented as an activity for enrichment, drilling, or practice.

In the K to 12 curriculum, the mother tongue serves as the medium of instruction for all subjects, except for Filipino and English (Awopetu, 2016). Valerio (2015) noted that the update of the curriculum aimed to meet the evolving needs of 21st-century learners. Responding to the demands of a rapidly advancing technological era, Philippine educational institutions aligned with global trends. Consequently, in 2012, the country introduced the Mother Tongue-Based Multilingual Education (MTB-MLE) program as a pivotal component of the K to 12 Basic Education Program. This initiative was following the passage of Republic Act 10533, also known as the "Enhanced Basic Education Act of 2013." According to Valerio's research, until recently, only three countries, including Djibouti, Angola, and the Philippines, had not yet adopted the K to 12 Curriculum over the past decade. Ultimately, the Philippines embraced and implemented this framework across all educational institutions.

According to Moschkovich (2002, as cited in Perez & Alieto, 2018), a child's first language is adequate for teaching mathematics. In relation, Elliott & Paton (2018) claimed that mathematics and science can be effectively taught directly in the mother tongue. Teaching mathematics in a child's first language is effective because it uses the language they know best, making it easier for them to understand and learn math concepts without language barriers.

Consuelo (2012), cited in Patalinghug et al. (2018), highlighted the critical role teachers play in bridging gaps, delivering meaningful lessons, and creating intervention materials that cater to specific skill development needs among learners. Emphasizing the importance of using the first language within the learners' context, teachers are urged to be mindful of their language use and adapt their communication to align with learners' linguistic backgrounds. Yeh (2017) pointed out that the native language supports multi-modal communication and encourages learners to actively utilize it. Promoting the use of learners' native language in education not only supports effective communication and cultural identity but also enhances learning outcomes by fostering a deeper understanding of academic content and promoting overall cognitive development.

The present study aligns with the perspectives of Lopez, Magsombol, and other researchers by emphasizing the effectiveness of MTB-MLE in numeracy instruction. Consistent with Lopez's assertion that teaching in the mother tongue builds on learners' existing knowledge and skills, the study at SPES revealed that using the mother tongue facilitates comprehension and contextualizes mathematical concepts for young learners. Similarly, findings support Moschkovich's and Elliott & Paton's claims that teaching mathematics in a child's first language eliminates language barriers, making numeracy more accessible and engaging. The study also resonates with Consuelo's and Yeh's views on the critical role of teachers in bridging linguistic and cultural gaps by adapting instructional strategies and assessments to suit learners' contexts. By investigating the lived experiences of teachers, the study reinforced the value of MTB-MLE in promoting equitable numeracy education and provided actionable insights to enhance its implementation in primary education.

The primary factor that influences learning the most is what the learner already knows (Fernandez and Abocejo, 2014). Hence, Medilo, (2016) stressed that When learners are taught in their mother tongue, their performance improves, and their cognitive processes become more effective. In addition, Hafiz and Farik, (2016) also discovered a significant improvement in math achievement among primary school learners in the post-test when using their native language, supporting the hypothesis of their study. In addition, Alimi et al. (2020) demonstrated a significant difference in achievement when mathematics was taught in learners' mother tongue, while Bernmahnn (2018) reported that teaching Haitian learners in their native language positively affected their academic performance in mathematics.

Pillos et al (2020) cited Rivera (2017), who concluded that learners who understand the key terminology used in mathematical word problems find it easier to learn how to formulate numerical equations. When learners are familiar with the specific terms and their meanings within the context of mathematics, they can more easily translate the verbal description of a problem into a mathematical equation or expression. This ability allows them to effectively apply mathematical operations and solve the problem accurately.

Similarly, the study of Eseung et al. (2024) revealed that using the mother tongue to teach basic concepts of numbers and operations lays a solid foundation for understanding and learning higher mathematics. This approach not only captures learners' interest but also serves as a starting point for introducing new mathematical concepts and principles, enhancing learners' comprehension of mathematical operations and processes.

In addition, Obod et al. (2019) concluded that both Mother Tongue and Non-Mother Tongue groups of learners began at a similar proficiency level before instruction. They found that the Mother Tongue group showed significant learning gains in fractions concepts, highlighting the effectiveness of Mother Tongue-Based Learning (MTBL) compared to Non-MTBL groups. Falguera's study (2022) also revealed a notable improvement in Grade 1 learners' mathematics performance following exposure to mother tongue-based instruction. This approach, which aligns activities with learners' linguistic comprehension, significantly enhances learning outcomes in mathematics.

Clegg & Simpson (2016) explained that familiarity with the language they use daily enhances their understanding of new concepts and content. This approach reduces the cognitive load associated with learning in a second language, allowing learners to focus more on understanding the material rather than deciphering unfamiliar language structures or vocabulary. Additionally, using familiar grammatical structures ensures that instructions and explanations are clear and accessible, facilitating smoother communication between teachers and learners.

In Cambodia, Lee et al. (2015) investigated the advantages of a bilingual program on learning outcomes in Khmer (the second language) and mathematics across a selection of bilingual schools compared to schools that exclusively used Khmer as the medium of instruction. The Early Grade Reading Assessment (EGRA) findings indicated no statistically significant effects on literacy in Khmer. However, other assessments revealed positive impacts on mathematics learning. Although the study did not clarify whether the treatment groups were randomly chosen or assigned, and it was limited to 50 schools, this research provides strong evidence in the literature that a mother-tongue program can positively influence academic performance in various subjects.

Similar to previous studies, Gorio et al. (2014) also concluded that learners' performance and learning improve when the mother tongue is used as the instructional language in the classroom. Omoniyi (2013) likewise highlighted the benefits of teaching mathematics in the mother tongue, such as overcoming unfamiliar word barriers and making the subject more accessible to learners. They also noted that children outside urban areas tend to learn better during the early stages of education when taught in their local language. These findings underscore the reliability and validity of using mother tongue-based teaching methods, suggesting that they are effective in facilitating learning outcomes.

In addition, Njoroge (2017) also investigated the effectiveness of using the mother language in teaching mathematics and science in Kenyan elementary schools. Results showed that elementary learners who were taught in their mother tongue demonstrated significant improvements in classroom performance compared to those taught in English. Njoroge emphasized that learning in one's native tongue facilitates the development of mathematical vocabulary that is easier to remember. He suggested that learners tend to perform below their potential when mathematics and science are taught in a second language (L2) during elementary school.

The discussion surrounding the impact of teaching in the mother tongue aligns closely with the present study's focus on the development of numeracy skills through MTB-MLE. As highlighted by Fernandez and Abocejo, learners' prior knowledge significantly influences learning, and when taught in their native language, learners can more effectively connect new concepts to their existing knowledge. Medilo emphasized that using the mother tongue improves learners' cognitive processes, while Hafiz and Farik observed significant improvements in mathematics achievement when learners were taught in their native language. These findings are in line with the present study, which explores how MTB-MLE can support numeracy development at Sorsogon Pilot Elementary School. Pillos et al. and Eseung et al. also

demonstrated that familiarity with key mathematical terminology in the mother tongue helps learners better understand and solve mathematical problems, reinforcing the study's focus on the role of language in facilitating numeracy. Studies by Obod et al. and Falguera further support this, showing significant learning gains in mathematics when the mother tongue is used as the instructional medium. This body of research underscores the effectiveness of MTB-MLE in improving numeracy skills, especially among younger learners, and aligns with the present study's objective to explore how MTB-MLE can enhance numeracy outcomes at SPES.

Challenges of the Teachers in Using MTB-MLE in Mathematics

Mathematics serves as a crucial tool for understanding the world (Furman, 2017), yet Žilinskiene and Demirbilek (2014) underscored that it is often perceived as challenging, presenting significant pedagogical challenges for teachers. Wei and Dzeng (2014) further emphasized that in Asia, mathematics is highly valued, leading to rigorous and strict practices aimed at enhancing children's achievements in the subject across many Asian countries.

Recent research has highlighted that a discrepancy between the language used for instruction and the language that learners speak and comprehend best can hinder effective teaching and learning (Jiang et al., 2019). Tackie-Ofosu et al. (2015) posited that understanding the language of instruction policy and the linguistic context of a country is crucial for improving learning outcomes, particularly in early education. Mismatches between the language used for teaching and learners' language proficiency can hinder academic progress. Aligning instruction with learners' linguistic backgrounds enhances comprehension, engagement, and overall academic achievement, fostering a supportive learning environment and equitable opportunities for success.

Ricablanca(2014) advocated for starting learners' education in their familiar and well-understood language, as it establishes a solid foundation and encourages regular school attendance. Using the mother tongue as the medium of instruction enables primary school learners to express their thoughts clearly, formulate new concepts based on their existing knowledge, and engage actively without the fear of making grammatical errors. This approach supports effective learning and confidence-building in learners from the outset of their education.

Aliñab et al. (2018) investigated the impact of Mother Tongue-Based Multilingual Education (MTB-MLE) as the medium of instruction in mathematics to enhance learner performance. The study employed a descriptive research method using researcher-made Mathematics Achievement Tests, document analysis of school forms, and interviews with teachers as data sources. Purposive sampling was used, focusing on large public primary schools, with 15 grade three Mathematics Teachers and 746 grade three learners participating.

Findings indicated that learners achieved "good" performance in items at the remembering and understanding levels when taught in either English or Filipino. However, performance was "fair" in items requiring the application of skills. Importantly, learners showed better performance in mathematics when Filipino was used as the medium of instruction. The results provided evidence that using learners' first language positively influences their achievement in mathematics.

DepEd Order No. 16, s. 2012, outlines guidelines for the implementation of Mother Tongue-Based Multi-Lingual Education (MTB-MLE). According to these guidelines, MTB-MLE is mandated for implementation across all public schools, particularly in Kindergarten and Grades 1, 2, and 3, as an integral part of the K to 12 Basic Education Program. Notably, the shift to using Mother Tongues (MTs) was hastily implemented (Alieto, 2018), resulting in teachers having to teach without adequate training.

Moreover, this sudden transition has also resulted in a lack of developed instructional materials in the Mother tongue, which are crucial for delivering quality education. Sario (2014) argued that teachers should improve their teaching strategies for Mother Tongue-Based Multilingual Education (MTB-MLE) and recommended the conduct of training for this purpose.

The cited works discussing the importance of aligning instruction with learners' linguistic backgrounds supports the present study's focus on the impact of Mother Tongue-Based Multilingual Education (MTB-MLE) on numeracy development at Sorsogon Pilot Elementary School (SPES). Research shows that using the mother tongue improves comprehension and engagement in mathematics, as it reduces language barriers and enhances learners' confidence. Studies also highlight the positive effects of MTB-MLE on performance, particularly when the instruction is in learners' first language, as seen in research by Aliñab et al. and the DepEd guidelines for implementing MTB-MLE. These findings directly relate to the study's investigation into how MTB-MLE supports numeracy development and teacher practices at SPES. Challenges such as inadequate teacher training and instructional materials, mentioned in the literature, are also relevant to the study's focus on improving MTB-MLE implementation.

Wa-Mbaleka (2014) executed a survey among 476 Filipino teachers of the English language and the results reported that the participants had a negative perception towards the mother tongue-based education in the Philippines. Mahboob and Cruz in 2013 showed similar results among non-teaching professionals. Premised on this current situation about Mother Tongue-based education in the Philippines, scholarly scrutiny with it as a variable is most indubitably going to contribute to the current discussion relative to mother tongue-based education.

As with many researchers, Patalinghug et al. (2018) found that teaching mathematics in the mother tongue significantly improves learners' performance in the subject. The application of mother tongue in mathematics instruction has proven effective in enhancing learners' learning outcomes, largely due to the efforts and competence of teachers implementing this approach. However, challenges have arisen, such as difficulties for teachers in translating technical mathematical terms into their mother tongue. Some mother tongues lack direct translations for these terms, which can hinder learners' understanding of mathematical concepts.

On the other hand, Eslit (2014) challenged the implementation of mother-tongue-based education in the Philippines, particularly its alignment with the mother-tongue approach. In connection, Llantos et al. (2022) concluded that the control group, which was taught mathematics in English, outperformed the experimental group, which was taught using the mother tongue as the medium of instruction. They found that using the mother tongue did not significantly impact the mathematical skills of grade four learners at Bliss Community School of Catbalogan City.

In addition, Sumbalan et al. (2017) conducted an experimental study at Bukidnon State University Laboratory School during the 2014-2015 academic year. They investigated the effects of using the mother tongue in teaching mathematics and science to grade 3 learners. The study randomly assigned participants to either the experimental or control group. Results indicated that learners performed better in mathematics and science when English was used as the medium of instruction.

These contradictory findings regarding the effectiveness of the mother tongue as a medium of instruction in teaching mathematics may be attributed to several factors. Despite the acknowledged importance of mathematics and more, the perspectives, experiences, and attitudes of teachers in mathematics education are undeniably significant. However, teachers' voices have not been prominently featured and thus are underrepresented in educational reform and education in general (Cohen & Mehta, 2017).

Wa-Mbaleka's survey on Filipino teachers' negative perceptions of mother tongue-based education, along with Mahboob and Cruz's similar findings among non-teaching professionals, highlights the existing challenges and skepticism surrounding the use of the mother tongue in the Philippines. This context is critical to understanding the discussion on mother tongue-based education in the present study. Patalinghug et al.'s research demonstrates that teaching mathematics in the mother tongue significantly improves learners' performance, although challenges such as translating technical terms can impede effectiveness. Conversely, Eslit and Llantos et al.'s studies question the impact of mother tongue-based instruction, suggesting that English instruction may sometimes lead to better performance. Additionally, Sumbalan et al.'s study found that English as a medium of instruction resulted in better outcomes in mathematics and science. These contradictory findings underscore the importance of teachers' perspectives in the debate on mother tongue-based instruction, which the present study aims to address by focusing on the experiences of teachers at Sorsogon Pilot Elementary School.

Caspillo (2022) found that teachers exhibited negative attitudes toward employing the mother tongue as the language of instruction in teaching mathematics. In relation, Melencion (2017) pointed out that some teachers are tasked with teaching in languages or vernaculars that are unfamiliar to them, including various multilingual dialects. This highlights the challenges of implementing Mother Tongue-Based Multilingual Education (MTB-MLE), especially considering the diverse variations of mother tongues within a single locality.

Cabansag (2014) highlighted in his study the challenges that teachers face with mother tongue-based instruction, specifically citing difficulties related to multilingual environments and the challenges of translation. Tundag, et al. (2020) had the same findings and noted that the translation of mathematical concepts or language into the mother tongue posed a significant challenge, while the preparation of exercises and activities was considered a moderate issue at a school in Dumaguete, Philippines.

Teachers in another school in the Philippines, as noted by Lartec, et al. (2014), faced similar challenges, including the absence of books written in the mother tongue, insufficient vocabulary, and inadequate teacher training. In the Philippine context, using the mother tongue often becomes a secondary language for learners, as they are more accustomed to using English mathematical terms at home rather than their native tongues. The lack of comprehensive vocabulary for translating mathematical concepts into the mother tongue emerges as a significant barrier to using the first language as the language of mathematics instruction. This shortage of diverse terms or phrases in the mother tongue complicates the process of educating children.

Tortola (2023) also identified similar challenges that teachers face when implementing Mother Tongue-Based Multilingual Education (MTB-MLE) in mathematics. These challenges include the inadequate availability of textbooks tailored for the mother tongue and a scarcity of manipulative materials in their classrooms. These shortcomings can hinder effective teaching and learning experiences, as textbooks and manipulatives are crucial tools for explaining mathematical concepts and engaging learners in hands-on activities that reinforce learning.

Caspillo's study revealed that teachers had negative attitudes towards using the mother tongue as the medium of instruction in mathematics, a sentiment echoed by Melencion, who highlighted the difficulties teachers face when teaching in unfamiliar languages or dialects. This points to the complexities of implementing Mother Tongue-Based Multilingual Education (MTB-MLE), especially in regions with multiple local dialects. Cabansag's research emphasized challenges such as multilingual environments and the difficulties of translating mathematical terms into the mother tongue. Tundag et al. further noted the

significant issues with translating mathematical concepts and preparing activities in the mother tongue, while Lartec et al. observed a lack of books and limited vocabulary for translating mathematical terms. Additionally, Tortola identified challenges such as the scarcity of textbooks and teaching materials in the mother tongue, which are essential for effective learning. These challenges are relevant to the present study, which examines the experiences of teachers implementing MTB-MLE in mathematics and the barriers they face in using the mother tongue to teach numeracy at Sorsogon Pilot Elementary School.

Strategies for Effective MTB MLE Integration in Mathematics

Mathematics education is critical for national development as it equips individuals with essential problem-solving and critical thinking skills necessary for tackling complex challenges across sectors like science, engineering, economics, and technology. That is why many countries prioritize the development of learners' mathematical competence due to its pivotal role in national development and growth (Simamora & Saragih, 2019).

Mathematical knowledge plays a crucial role in developing learners' problem-solving abilities and fostering sound judgment. By acquiring mathematical skills, learners gain the ability to analyze situations, formulate logical arguments, and devise effective solutions to complex problems. (Marquez, 2023). Acquiring math skills not only enhances their cognitive capacity but also equips them with practical tools for addressing real-world challenges across various domains of life and academic disciplines. Mutawah et al. (2019) argued that a learner's proficiency in mathematics alone can indicate their potential in this aspect of mental capacity.

However, language confusion in schools can lead to a loss of interest among many learners, particularly those who are transfer learners with a different first language (L1). These learners often struggle to understand lessons conducted in a language they are not familiar with, which can result in their disengagement from classroom activities. When learners cannot fully participate due to language barriers, their educational experience may become frustrating and less rewarding, potentially impacting their overall academic performance and motivation to attend school (Casalan et. al., 2016 cited in Baquiller & Abellon Jr., W. (2021).

Mathematics education is essential for national development, providing individuals with the problem-solving and critical thinking skills necessary for addressing challenges in fields like science, engineering, and technology, as highlighted by Simamora & Saragih. Marquez further emphasizes that mathematical knowledge fosters learners' ability to analyze, make logical arguments, and devise solutions. Mutawah et al. argue that proficiency in mathematics reflects learners' mental capacity, while Casalan et al. point out the negative impact of language barriers, especially for transfer learners with a different first language (L1). These language challenges can lead to disengagement and reduced academic performance, underscoring the importance of using the mother tongue in education to support learners' participation and motivation. These findings are relevant to the present study, as it examines how MTB-MLE can enhance numeracy development at SPES by addressing language barriers in the learning process.

In Ghana, mathematics performance among learners in rural schools is consistently low and declining each year (Bariham et al., 2017). Despite this trend, policymakers historically prioritize urban schools, neglecting empirical research that could inform effective teaching strategies in remote areas (Acheampong et al., 2019). Englis and Boholano (2021) demonstrated the effectiveness of using the mother tongue in mathematics teaching. They recommend that teachers should focus on developing practical teaching methods and strategies, emphasizing contextualization and innovation.

O'Brien et al. (2020) concluded that teacher-child interactions play a vital role in determining the quality of early childhood education, with multilingualism becoming more common in many educational environments. Effective verbal communication is crucial for fostering a healthy teacher-learner relationship, serving as a foundation for cognitive development. It enables teachers to gain insight into learners' thoughts, while learners understand teachers' expectations. This open exchange establishes a classroom environment built on mutual trust and respect, promoting a healthy learning atmosphere (Rawat, 2016).

Israel and Thomas (2013) commented that starting with the language that young learners speak at home is crucial because it creates a foundation of familiarity and comfort in the learning process. When education begins in a child's mother tongue or home language, it immediately connects classroom instruction with their everyday experiences and cultural context. This connection helps bridge the gap between what learners know from their home environment and what they are taught in school. It facilitates deeper understanding and easier absorption of new concepts, as learners can more readily relate to and engage with the content being taught.

Edwards & Ngwaru (2014) explained that when children begin their literacy journey by learning fundamental skills in their mother tongue, supported by well-trained teachers, high-quality instructional materials, and age-appropriate learning opportunities, they build a strong foundation. Mirici (2020) argued that this foundation not only enhances their understanding and mastery of basic literacy skills but also facilitates a smoother transition to learning in a second or international language. The proficiency gained in their mother tongue provides cognitive scaffolding that supports the acquisition of new languages, helping children transfer and apply their literacy skills effectively across different linguistic contexts.

In the study of Tundag et al. (2020), teachers faced significant challenges in translating mathematical concepts or language to their learners, which was classified as a "serious" problem. They also encountered "moderate" difficulties in utilizing effective questioning skills and providing exercises and activities. Additionally, there was a "slight" issue with employing effective reactive techniques. The study noted a "slight" negative relationship between the extent of translation problems faced by teachers and their learners' academic performance.

The cited studies highlighted from Ghana and other contexts support the importance of using the mother tongue in teaching mathematics to improve learner performance, especially in rural settings. This aligns with the present study at SPES, which focuses on how MTB-MLE can enhance numeracy skills among Grade 3 pupils by addressing language barriers. Effective teacher-child interactions and the use of the learners' home language are emphasized as critical for building understanding and engagement in learning. Additionally, the challenges teachers face in translating mathematical concepts further underscore the need for MTB-MLE, which the present study aims to explore as a solution to improve learning outcomes in mathematics.

Dio and Jamora (2014) said using the mother tongue in the early years of schooling is crucial for successful learning outcomes. It helps bridge the gap between home language and school instruction, facilitating better understanding and engagement among learners. Researchers suggest the development of translation dictionaries specifically for mathematics, serving as a valuable reference tool for local teachers. Baquiller & Abellon Jr. (2021) recommended translating more mathematical terms into the mother tongue or native language. They also recommended that faculty members teaching mathematics should undergo seminars and training sessions on MTB-MLE instruction to enhance their delivery of the subject matter. This

initiative aims to support teachers in effectively conveying mathematical concepts in learners' native languages, thereby enhancing learning experiences and academic achievement.

To foster critical thinking among learners, mathematics teachers should demonstrate initiative, creativity, and resourcefulness in their teaching methods (Janna & I, 2019). This involves engaging learners with innovative approaches that encourage deep understanding and problem-solving skills in mathematics. Boudersa (2016) underscored that teachers would benefit greatly from additional training, workshops, and seminars focused on the correct and effective use of learners' first language in the teaching and learning process. Teachers need to develop their competence in integrating MTB MLE into mathematics instruction.

Reynders (2014) found that learners, despite being instructed in a second language, prefer to discuss and express their opinions about mathematical content using their mother tongue. During group activities, learners often revert to their native language to freely exchange thoughts and ideas. This language preference affects how mathematics is taught and learned, leading to varied levels of participation and comprehension among learners.

The studies reviewed emphasize the significance of using the mother tongue in the early years of education, particularly in mathematics, to enhance learners' understanding and engagement. This aligns with the objectives of the present study at SPES, where MTB-MLE is explored as a strategy to improve numeracy skills. Recommendations for developing translation dictionaries and providing teachers with training in MTB-MLE are crucial for supporting effective instruction in learners' native languages. The study also highlights the need for teacher creativity and critical thinking in fostering deeper mathematical understanding. Additionally, learners' preference for using their mother tongue to discuss mathematical concepts underscores the relevance of integrating MTB-MLE into instruction to improve participation and comprehension.

In the study of Rikhotso (2015), all participants were tested in Mathematics, revealing that half of the learners who passed attributed their success to their mothers teaching them in their native language, which facilitated both learning and expressive freedom. Conversely, one learner who failed the exam advocated for integrating the mother tongue into the educational system, noting widespread negative attitudes toward Mathematics among learners. This suggests that using the mother tongue in Mathematics education can foster positive attitudes that contribute to academic success.

In relation, Fabrigar (2017) observed that when the mother tongue is used in the classroom, learners become more active, participative, and interactive. This is because they have a familiar language to express their ideas, feelings, and opinions. She noted that activities conducted in the mother tongue lead to greater learner engagement and interaction, as the common language allows them to communicate more freely and confidently. This approach also enhances learners' sense of belonging, giving them more opportunities to participate. Additionally, Fabrigar emphasized the importance of teachers having effective classroom management styles to control any negative behaviors that might arise.

Englis and Boholano (2021) also found that using the mother tongue in teaching mathematics effectively facilitates the acquisition of mathematical knowledge. Teachers were well-prepared in terms of content and instructional material preparation. Furthermore, a contextualized and innovative model for teaching mathematics in the mother tongue aids in acquiring basic mathematical skills. This finding underscores the importance of contextualization and innovation in teaching strategies. It suggests that school administrators should continuously support teachers' development plans and provide the necessary tools and equipment to enhance teaching effectiveness.

Aside from the provision of training and contextualization of materials, Balaoro (2014) claimed that stakeholder support is crucial in addressing the challenges teachers face in implementing the MTB-MLE Program. This finding underscores the integral role of community involvement in creating an effective educational system, as proposed by Henderson (2016). When stakeholders actively participate, they provide essential resources and support, fostering a collaborative environment that enhances the overall effectiveness and sustainability of educational initiatives. This collective effort not only mitigates the difficulties encountered by teachers but also strengthens the educational framework, leading to improved outcomes for learners.

The reviewed studies highlight the benefits of using the mother tongue in mathematics education, particularly in fostering positive attitudes and improving learner engagement. The present study at SPES aligns with these findings, as it examines the effectiveness of MTB-MLE in enhancing numeracy skills. The studies show that learners who are taught in their native language are more confident and participative, which can contribute to academic success. The importance of teacher preparation, contextualization, and innovation in teaching practices is emphasized, suggesting that training and support for teachers are key to effective implementation of MTB-MLE. Additionally, community and stakeholder support play a critical role in overcoming challenges and ensuring the sustainability of educational programs, reinforcing the collaborative approach needed for improved learning outcomes.

Gap Bridged by the Study

The reviewed literature and studies highlight the significant role of the mother tongue in the effectiveness of mathematics instruction. They also address the challenges of integrating MTB-MLE (Mother Tongue-Based Multilingual Education) in mathematics and discuss various strategies to enhance its integration. However, the cited works did not elaborate on teachers' perceptions of the impact of MTB-MLE on math teaching. They did not explore the specific strategies teachers employ when using the mother tongue or how teachers contextualize their materials. Furthermore, the researcher did not find any studies that examined the challenges of teaching mathematics using the mother tongue within the local context. This indicates a need for research focused on teachers' perspectives and their practical approaches to implementing MTB-MLE in mathematics, as well as an exploration of the unique difficulties faced in local educational settings. This is the gap bridged by the present study.

Theoretical Framework

The foundation of this research on developing numeracy skills of key stage 1 learners using Mother Tongue-Based Multilingual Education (MTB-MLE) is grounded in several interrelated educational theories that emphasize active learning, cultural relevance, and individualized instruction. The framework integrates Constructivist Theory, Sociocultural Theory, Experiential Learning, Critical Pedagogy, the Theory of Multiple Intelligences, and the Theory of Scaffolding to highlight how these concepts influence teaching strategies and learner outcomes in numeracy instruction.

The Constructivist Theory, as proposed by Piaget (1971), highlights the idea that learners actively construct their knowledge by interacting with their environment and engaging in problem-solving tasks. This theory suggests that learning is not a passive process where learners simply absorb information; rather, they take an active role in understanding new concepts by building on their prior knowledge and experiences. In doing so, learners make sense of new material by connecting it to what they already know, often through hands-on activities that encourage exploration and critical thinking.

According to Chand (2024), this theory emphasizes that learning occurs when learners engage with real-world experiences, reflect on those experiences, and interact with new ideas. Constructivism places a

strong focus on the importance of experience and reflection in shaping understanding. In the context of classroom learning, this means that learners learn more effectively when they can engage with content practically and interactively.

In the context of Mother Tongue-Based Multilingual Education (MTB-MLE), constructivism emphasizes the importance of connecting mathematical concepts to learners' personal experiences and cultural backgrounds. By using their native language, learners can relate abstract mathematical ideas to their everyday lives, making these concepts more meaningful and easier to grasp. This approach enhances comprehension, fosters deeper retention, and helps learners see the relevance of mathematics in their contexts. For example, solving problems in their mother tongue allows learners to connect mathematical principles to familiar activities, like counting objects or understanding distances, reinforcing their understanding and retention.

Vygotsky's (1978) sociocultural theory complements this approach by highlighting the role of social interaction and cultural context in learning. Learning is seen as a collaborative process, where knowledge is co-constructed through communication and shared experiences. Vygotsky's concept of the "zone of proximal development" (ZPD) underscores the importance of guided support, or "scaffolding," in helping learners reach higher levels of understanding. Scaffolding involves providing structured assistance, enabling learners to progress beyond their current abilities and deepen their comprehension.

In MTB-MLE, Vygotsky's theory supports the use of the mother tongue as a tool for social interaction and knowledge construction. Teaching mathematical concepts in the learners' native language connects abstract ideas to familiar cultural and linguistic contexts, making it easier for students to understand and apply these concepts. Collaborative learning, facilitated by teachers or peers, further enhances this process, allowing learners to communicate more effectively and engage with the material in a culturally meaningful way.

By integrating constructivism and Vygotsky's sociocultural theory, MTB-MLE promotes a learner-centered environment where learners actively participate in their learning process. This combination of the ZPD, scaffolding, and the use of the mother tongue makes learning more accessible and relevant, fostering an inclusive, supportive learning environment. Through collaborative learning and cultural relevance, learners are empowered to confidently explore mathematical ideas, strengthening their comprehension and overall learning experience.

Kolb's (1984) Experiential Learning Theory emphasizes that knowledge is acquired through the combination of concrete real-world experiences and reflection on those experiences. This theory suggests that learning is most effective when learners actively engage in tasks that allow them to experiment and apply concepts in practical settings. According to Kolb, the learning process involves a cycle of four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation. This cyclical process encourages learners to gain insights from their experiences and to continuously refine their understanding through reflection and application.

Bui et al. (2022) elaborate on the practical aspects of experiential learning, which include hands-on activities such as project-based learning, field trips, simulations, and service learning. These activities link theoretical knowledge to practical applications, enabling learners to see how abstract concepts function in real-life situations. Through active participation, learners are not just passive recipients of information but are instead collaborators in their learning process. This deep engagement fosters collaboration, critical thinking, and problem-solving skills, leading to a more meaningful and lasting understanding of the subject matter.

In the context of Mother Tongue-Based Multilingual Education (MTB-MLE), experiential learning aligns perfectly with the approach of connecting mathematical concepts to learners' everyday experiences. By using tasks and problems grounded in real-life contexts familiar to the learners, such as solving problems related to their home, community, or cultural traditions, learners can better understand abstract mathematical ideas. For example, learners might engage in activities like calculating quantities for a local festival or determining the number of ingredients needed for a family recipe, which are both culturally relevant and practically applicable.

Additionally, the use of culturally specific games and activities in numeracy instruction within MTB-MLE can provide an interactive and engaging way for learners to learn math. Games that involve counting, strategy, or measurement—adapted to the local cultural context—help to make abstract mathematical concepts more concrete. By interacting with numeracy tasks that relate to their everyday lives, learners can visualize and understand how mathematical principles apply in real-world situations.

This practical engagement also encourages learners to reflect on the relationships between the math they are learning and their daily routines, enhancing comprehension. Experiential learning through MTB-MLE not only promotes better retention of concepts but also allows learners to build confidence in their mathematical abilities by seeing the relevance of their learning. In this way, experiential learning within MTB-MLE offers a powerful framework for connecting academic knowledge to the lived experiences of learners, making education more meaningful and effective.

Critical Pedagogy, as conceptualized by Freire (1970), is an educational approach aimed at empowering learners to challenge societal power structures and engage in meaningful, transformative learning. Freire argued that education should not merely transfer knowledge but should be a process of liberation, encouraging learners to question, reflect, and take action on social inequalities. Through this lens, education becomes a tool for fostering critical consciousness, allowing learners to actively participate in shaping their own lives and societies.

Muhammad & Uddin (2019) further explain that critical pedagogy promotes learner agency through active participation, dialogue, and reflection. In this framework, learners are encouraged to become co-creators of knowledge, where learning is deeply connected to real-world issues. Rather than accepting societal norms and power structures as they are, learners are empowered to analyze and challenge them. This prepares them not only to succeed academically but also to be informed, critical thinkers who can actively engage in democratic processes and advocate for change in their communities.

Within the Mother Tongue-Based Multilingual Education (MTB-MLE) framework, critical pedagogy aligns with the idea of valuing and integrating learners' linguistic and cultural backgrounds into the educational process. By using the mother tongue in numeracy instruction, critical pedagogy supports an inclusive education that recognizes and respects the cultural identities and lived experiences of learners. This approach helps break down traditional power dynamics in the classroom, where instruction in a dominant or foreign language may marginalize learners from linguistic minorities. Instead, MTB-MLE embraces the mother tongue as a tool for empowerment, ensuring that learners can access and engage with mathematical concepts in ways that are culturally relevant and meaningful.

Using the learners' native language in instruction not only aids comprehension but also enhances critical thinking, as it allows learners to draw from their personal and cultural experiences. In the context of numeracy, this could mean connecting mathematical concepts to familiar, real-world situations—such as community practices or economic activities—that are part of the learners' everyday lives. By framing math education within the context of learners' cultural realities, MTB-MLE empowers learners to approach

learning critically, using their knowledge to analyze societal norms and contribute to community development.

Moreover, critical pedagogy within MTB-MLE encourages dialogue and collaboration, allowing learners to reflect on their learning and engage with peers and teachers in discussions about how the material connects to broader social and cultural issues. This reflective process fosters a deeper understanding and critical awareness, as learners are not simply absorbing facts but are actively engaging in discussions that encourage them to question, think critically, and apply their knowledge in meaningful ways.

Critical pedagogy in the MTB-MLE framework promotes an education that is not only inclusive of learners' linguistic and cultural identities but also empowers them to engage critically with mathematical concepts and the world around them. By incorporating their mother tongue and cultural context into learning, learners are better equipped to challenge societal norms, think critically, and actively participate in shaping their communities and futures.

Gardner's (1983) Theory of Multiple Intelligences suggests that learners possess different types of cognitive strengths and learning styles, which extend beyond traditional measures of intelligence. Gardner identified several distinct intelligences, including linguistic, logical-mathematical, spatial, interpersonal, intrapersonal, musical, bodily-kinesthetic, and naturalistic intelligences. This theory proposes that individuals are not limited to one mode of learning but instead demonstrate a range of cognitive abilities. By recognizing these varied intelligences, teachers can better understand how learners learn and tailor their teaching to accommodate the diverse ways in which learners process and apply knowledge.

Lumei & Turda (2022) explain that Gardner's theory offers teachers a framework for differentiating instruction by incorporating diverse teaching strategies that cater to different learning styles. For example, teachers can use visual aids for learners with strong spatial intelligence, music for learners with musical intelligence, and hands-on activities for those with bodily-kinesthetic intelligence. This approach ensures that instruction is inclusive, reaching learners with different strengths and providing opportunities for personalized learning. By adopting multiple teaching methods, teachers can engage all learners, allowing each learner to shine in their area of strength while also developing their weaker areas.

In the Mother Tongue-Based Multilingual Education (MTB-MLE) framework, the application of Gardner's theory is especially valuable, as it allows teachers to address the diverse intelligences of learners through culturally and linguistically relevant instruction. MTB-MLE's focus on using the learners' native language in instruction creates an ideal setting for implementing varied approaches to learning, particularly in numeracy instruction. By delivering numeracy lessons that connect to learners' strengths, teachers can enhance engagement and comprehension.

For example, learners with strong linguistic intelligence may benefit from numeracy instruction that involves verbal problem-solving in their mother tongue. They may find it easier to articulate and understand mathematical problems when presented in a language they are comfortable with. This not only improves comprehension but also builds confidence as learners engage with math concepts through familiar linguistic patterns.

On the other hand, learners with logical-mathematical intelligence might excel when presented with structured numerical exercises or logic-based challenges. Teachers can design lessons that focus on patterns, sequences, and problem-solving techniques, catering to these learners' natural affinity for reasoning and systematic thinking. These learners may engage more deeply with abstract numerical concepts, especially when the problems are contextualized within familiar cultural scenarios.

Additionally, Gardner's theory allows teachers to incorporate other intelligences into numeracy instruction. For instance, those with spatial intelligence could benefit from visual representations of mathematical problems, such as charts, graphs, or diagrams. Learners with bodily-kinesthetic intelligence might engage in hands-on activities like using physical objects for counting or measuring. These varied approaches help learners relate abstract mathematical concepts to real-world applications, supporting a deeper and more meaningful understanding.

By integrating the principles of multiple intelligences with MTB-MLE, teachers can create a strengths-based approach to numeracy learning, where learners' cognitive abilities are recognized and leveraged. This approach promotes not only better learning outcomes but also an inclusive classroom environment that values each learner's unique abilities and cultural background. In this way, the use of multiple intelligences in MTB-MLE fosters holistic development, enabling learners to access and excel in numeracy through approaches that resonate with their learning styles and experiences.

Bruner's (1976) Theory of Scaffolding emphasizes that learners can achieve deeper understanding with the help of temporary support from teachers, which is gradually withdrawn as the learner becomes more independent and proficient. Scaffolding is akin to a framework provided during the learning process, enabling learners to tackle new and challenging concepts with guidance, and as they gain understanding, the level of assistance is gradually reduced. This approach allows learners to progress at their own pace, fostering both confidence and competence as they work towards mastering the material.

Basir & Wijayanti (2020) explains that in math teaching, scaffolding involves structured guidance in the form of breaking down complex problems into smaller, more manageable parts. Teachers offer support through strategic questioning, feedback, and modeling of problem-solving strategies. By asking guiding questions and providing hints or cues, teachers facilitate learners' cognitive processes without giving away the solution. As learners develop their problem-solving skills and gain a better understanding of the concepts, the teacher reduces their level of assistance, allowing learners to take greater responsibility for their learning.

In the context of Mother Tongue-Based Multilingual Education (MTB-MLE), scaffolding takes on a unique form by using the learners' mother tongue as a bridge to understanding more abstract or complex mathematical concepts. Initially, mathematical ideas are explained using familiar language and cultural references that resonate with the learners' everyday experiences. By grounding the teaching in their native language, learners can grasp foundational numeracy concepts with greater ease and clarity. This builds their confidence as they engage with math in a language they fully understand, making abstract concepts more accessible and less intimidating.

As learners become more confident and competent in understanding these foundational concepts, teachers can begin to introduce more academic or abstract mathematical terms, often in the second language (such as English or Filipino), while still relating these new terms to the concepts first explained in the mother tongue. This gradual transition is key to scaffolding within MTB-MLE. It allows learners to move from familiar linguistic and cultural contexts to broader academic language in a way that doesn't overwhelm them. The mother tongue serves as a scaffold for the introduction of new terms, concepts, and problem-solving strategies.

For example, when teaching mathematical operations like addition and subtraction, a teacher might initially explain the process using everyday situations—like counting fruits or dividing items among family members—using the learners' native language. Once learners have a solid understanding, the teacher might then introduce more formal mathematical terminology or symbols in a second language, but

still ensure that the concepts are tied back to the original explanations in the mother tongue.

This scaffolded approach not only supports numeracy development but also nurtures learners' ability to shift between languages, enhancing both their linguistic and cognitive abilities. By starting in the language they are most comfortable with, learners can build a strong foundation in numeracy before being introduced to more abstract academic concepts and language. In this way, scaffolding within MTB-MLE provides a structured yet flexible approach that adapts to the learners' needs, enabling them to achieve success in both mathematics and multilingual education.

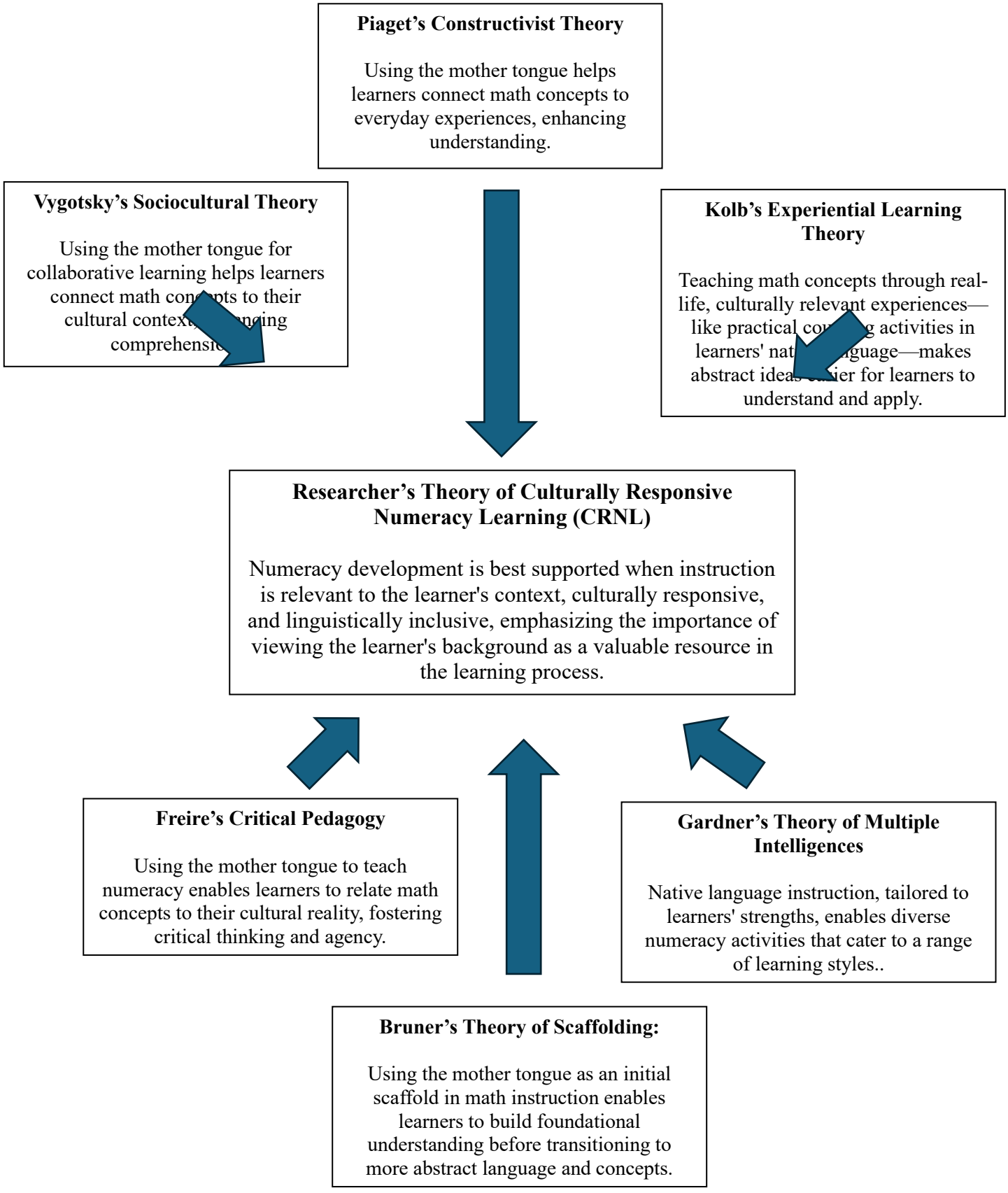
The application of various educational theories—Constructivist Theory, Sociocultural Theory, Experiential Learning Theory, Critical Pedagogy, Multiple Intelligences Theory, and Scaffolding Theory—provides a comprehensive framework for understanding and enhancing numeracy instruction within the Mother Tongue-Based Multilingual Education (MTB-MLE) context. Each theory contributes unique insights into how learners process information, interact with their cultural backgrounds, and develop mathematical skills. By emphasizing active engagement, social collaboration, personalized learning, critical thinking, and scaffolding support, these theories collectively advocate for a holistic and inclusive approach to education. This integration not only respects and utilizes learners' linguistic and cultural identities but also empowers them to build confidence and competence in their numeracy skill

Building on the theories cited, the researcher introduces the Theory of Culturally Responsive Numeracy Learning (CRNL). Integrating these foundational ideas, the CRNL theory asserts that numeracy development is most effectively achieved when instruction is contextually relevant, culturally responsive, and linguistically inclusive, with an emphasis on recognizing the learner's background as a valuable asset in the learning process.

The CRNL approach plays a pivotal role in enhancing numeracy instruction within the framework of Mother Tongue-Based Multilingual Education (MTB-MLE). It is grounded in the understanding that learners' cultural backgrounds and native languages have a profound impact on their ability to grasp mathematical concepts. By prioritizing culturally relevant content, CRNL ensures that numeracy lessons are not only accessible but also meaningful to students. Incorporating the mother tongue facilitates connections between mathematical ideas and the learners' everyday experiences, making learning both engaging and comprehensible.

In Culturally Responsive Numeracy instruction, mathematical problems are framed within familiar cultural contexts, bridging the gap between abstract mathematical concepts and real-life applications. For instance, using cultural practices such as calculating quantities for community events or measuring ingredients for traditional dishes makes math more concrete and relevant. This approach not only enhances understanding but also fosters a deeper appreciation of mathematics by illustrating its real-world relevance.

Moreover, CRNL emphasizes the importance of teachers adapting their instructional strategies to reflect the linguistic and cultural diversity of their students. It advocates for a learner-centered approach, where teaching methods are customized to meet individual needs, learning styles, and cultural backgrounds. This aligns with the principles of differentiated instruction, offering students multiple opportunities to demonstrate their understanding through diverse modes of learning. Within this framework, the integration of the mother tongue in numeracy education becomes a crucial tool for scaffolding comprehension, enabling learners to engage with the curriculum in a way that is both linguistically and culturally meaningful.


Piaget's Constructivist Theory
Using the mother tongue helps learners connect math concepts to everyday experiences, enhancing understanding.
Vygotsky's Sociocultural Theory
Using the mother tongue for collaborative learning helps learners connect math concepts to their cultural context, enhancing comprehension.
Kolb's Experiential Learning Theory
Teaching math concepts through real-life, culturally relevant experiences—like practical cooking activities in learners' native language—makes abstract ideas easier for learners to understand and apply.
Researcher's Theory of Culturally Responsive Numeracy Learning (CRNL)
Numeracy development is best supported when instruction is relevant to the learner's context, culturally responsive, and linguistically inclusive, emphasizing the importance of viewing the learner's background as a valuable resource in the learning process.
Freire's Critical Pedagogy
Using the mother tongue to teach numeracy enables learners to relate math concepts to their cultural reality, fostering critical thinking and agency.
Gardner's Theory of Multiple Intelligences
Native language instruction, tailored to learners' strengths, enables diverse numeracy activities that cater to a range of learning styles..
Bruner's Theory of Scaffolding:
Using the mother tongue as an initial scaffold in math instruction enables learners to build foundational understanding before transitioning to more abstract language and concepts.

Conceptual Framework

The Input-Process-Output-Outcome (IPOO) model presented in Figure 2 serves as the conceptual framework for this study, offering a systematic approach to analyzing the implementation of Mother Tongue-Based Multilingual Education (MTB-MLE) in numeracy instruction for key stage 1 learners. This model provides a clear, organized structure for understanding how teachers perceive, apply, and contextualize MTB-MLE strategies in teaching mathematics, as well as how these strategies affect learner outcomes. Each component of the model breaks down the critical elements of the study, illustrating the interplay between the inputs (teacher insights and strategies), the process (methods of data collection), the outputs (proposed enhancements), and the desired outcomes (improved numeracy skills). This structured approach ensures that the research not only explores teacher experiences but also aims to inform actionable improvements in teaching practices.

The input section of the research framework highlights the key factors that inform the study. This includes examining the impact of Mother Tongue-Based Multilingual Education (MTB-MLE) on numeracy skill development among key stage 1 learners. Additionally, it explores the strategies employed by teachers in developing these numeracy skills using MTB-MLE. Another focus is on identifying the challenges teachers face in implementing MTB-MLE, particularly when it comes to translating mathematical terms and concepts into the learners' mother tongue. Furthermore, the input section looks into the contextualization, translation, and localization of numeracy instruction within the MTB-MLE framework. Finally, the role of assessment in supporting teachers' efforts to enhance numeracy skills is also a critical component.

This model's structure begins with the Input phase, which examines foundational elements impacting numeracy instruction. By focusing on how MTB-MLE affects numeracy skill development, the research delves into teachers' strategies, the challenges of translating mathematical terms into learners' mother tongues, and the importance of contextualizing math concepts within MTB-MLE. Additionally, assessment practices that support and guide numeracy development are considered, helping to pinpoint factors that contribute to or hinder effective numeracy instruction and setting the stage for targeted improvements.

The process section outlines the methodology utilized to gather data. The primary method mentioned is the Focus Group Discussion, which involves teachers sharing their experiences and insights on the use of MTB-MLE in teaching numeracy. Through these discussions, the study collects qualitative data that reflects the practical challenges, successes, and strategies teachers employ in the classroom. The process aims to capture the collective experiences of teachers, helping the researcher understand the effectiveness and areas of improvement within the MTB-MLE framework.

In the Process phase, data collection—particularly through Focus Group Discussions (FGDs) with teachers—captures in-depth insights into teachers' experiences with MTB-MLE in numeracy. This qualitative approach highlights the specific strategies used, challenges faced, and successes observed, all of which help build a comprehensive understanding of MTB-MLE's practical applications. This clarity enables the identification of specific areas for improvement in teaching processes.

The output section highlights the key result of the research: the Proposed Enhanced MTB-MLE Program for Developing Key Stage 1 Numeracy Skills. Drawing from insights gained through focus group discussions, the researcher has designed a refined MTB-MLE program that addresses the challenges identified while improving the strategies already in use. This program consists of two major components: Component 1: Teacher Professional Development and Instructional Material Design, and Component 2:

Parent and Community Involvement. The initiative includes a series of activities aimed at providing teachers with stronger support in fostering numeracy skills while making instruction more contextually relevant and effective within the MTB-MLE framework. These components aim to enhance both teaching practices and community engagement, ensuring a more holistic approach to improving learners' numeracy development.

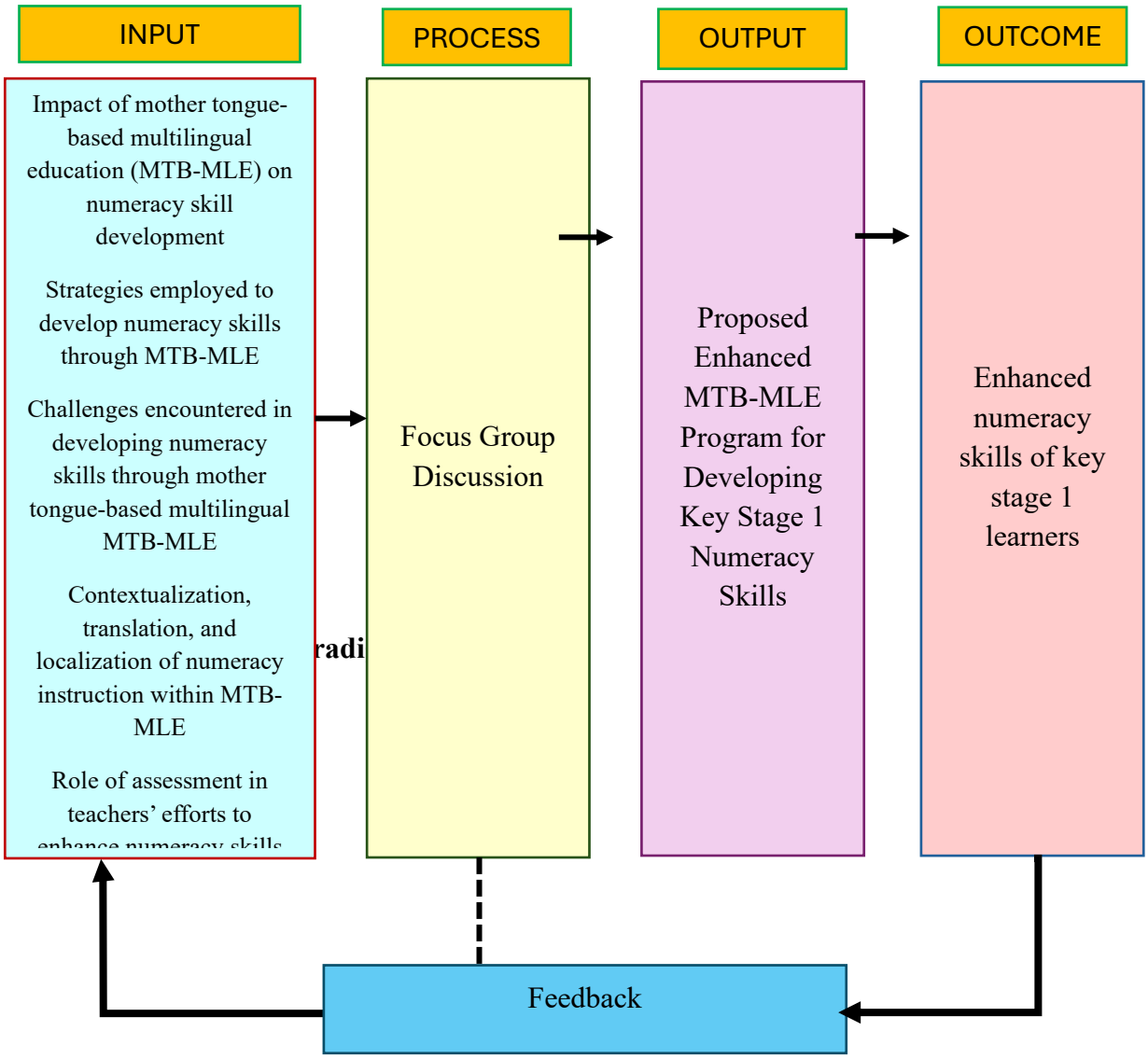
From the insights, the Output phase emerges, leading to the Proposed Enhanced MTB-MLE Program for Developing Numeracy Skills. This program comprises two core components: Teacher Professional Development and Instructional Material Design, aimed at refining teachers' skills and providing culturally relevant instructional resources, and Parent and Community Involvement, which seeks to engage families and the community to foster a supportive learning environment. These elements directly address identified challenges while reinforcing existing strategies to bolster numeracy development.

The outcome of the research is the Enhanced Numeracy Skills of Key Stage 1 Learners. Sub-intermediate outcomes include improved teacher competency, more effective assessment strategies, increased parent involvement, and higher-quality instructional resources. By implementing the proposed enhancements to the MTB-MLE program, the study aims to ensure significant improvement in numeracy skills among key stage 1 learners. Ultimately, this outcome reflects the core objective of the research—to demonstrate that using the mother tongue in mathematics instruction not only aids comprehension but also boosts overall academic performance in numeracy.

The program's anticipated Outcome is the Enhanced Numeracy Skills of Key Stage 1 learners. With improved teacher competencies, refined assessment methods, active community involvement, and high-quality instructional materials, the study aims to achieve measurable growth in learners' numeracy abilities. By leveraging MTB-MLE for mathematics instruction, it is expected that learners will better grasp mathematical concepts, thus boosting their overall academic achievement in numeracy. A continuous feedback loop involving teachers and learners will ensure ongoing program refinement, making the MTB-MLE program adaptive to the evolving educational landscape and sustaining progress.

Finally, feedback is highlighted as a crucial element throughout the process. The framework suggests that continuous feedback loops, likely from teachers and learners, will help refine the proposed program and its implementation. This iterative feedback mechanism ensures that the program remains responsive to the needs of both teachers and learners, ultimately enhancing the effectiveness of MTB-MLE in numeracy instruction.

The Input-Process-Output-Outcome (IPOO) model provides a structured approach to enhance Key Stage 1 learners' numeracy skills by improving the application of Mother Tongue-Based Multilingual Education (MTB-MLE) strategies. It begins by examining key factors (inputs) like teacher strategies, challenges in translating mathematical concepts, and assessment methods, which influence effective numeracy instruction. Through Focus Group Discussions, the process phase gathers insights into teachers' real-world experiences with MTB-MLE, which inform the creation of an enhanced program. This program includes professional development for teachers and community engagement to better support numeracy learning. The outcome is improved numeracy skills, driven by enhanced teaching competencies, effective assessments, and adaptive feedback loops that ensure the program evolves to meet learners' needs.



CHAPTER III
METHOD AND PROCEDURE

This study examined the perceptions and experiences of key stage 1 mathematics teachers at Sorsogon Pilot Elementary School (SPES) regarding the implementation of Mother Tongue-Based Multilingual Education (MTB-MLE) in numeracy instruction for primary learners. It investigated how SPES teachers perceive the impact of MTB-MLE on numeracy skill development, the strategies used to develop numeracy skills within this framework, and the challenges encountered. The study also explored how teachers contextualize, translate, and localize numeracy instruction within MTB-MLE and assessed the role of assessment in enhancing numeracy skills. Additionally, it aimed to identify potential improvements to school-based MTB-MLE programs for key stage 1 learners to better support their numeracy skill development.

Appropriateness Of Design

This study applies a phenomenological approach to explore how MTB-MLE impacts the development of numeracy skills among key stage 1 learners at Sorsogon Pilot Elementary School (SPES). Phenomenology examines individuals' conscious experiences from their first-person perspective, aiming to understand how

teachers' experiences with MTB-MLE influence their teaching practices and, consequently, learners' numeracy development.

The phenomenological method, influenced by the philosophical traditions of Husserl, Heidegger, Merleau-Ponty, and Sartre, investigated how phenomena were perceived and experienced by individuals. In the context of MTB-MLE in mathematics, this approach was particularly relevant as it explored how the integration of the mother tongue into numeracy instruction affects both teaching and learning. Merleau-Ponty's non-representational theory, which emphasized embodiment and the interconnectedness of being with the world, helped to understand how teachers and learners engaged with mathematical concepts through their native languages. This perspective highlighted how using the mother tongue in teaching can shape the subjective experiences of both teachers and learners, offering deeper insights into how such instructional strategies influenced numeracy development.

By exploring the lived experiences of teachers implementing MTB-MLE, the study provides a comprehensive view of how this educational strategy contributed to numeracy skills development and aligned with the lived realities of both learners and teachers. This approach allowed for an in-depth examination of how incorporating the mother tongue into numeracy instruction influenced teaching practices and learning outcomes.

Research Questions

This study explored the perceptions and experiences of key stage 1 mathematics teachers at Sorsogon Pilot Elementary School (SPES) concerning the use of Mother Tongue-Based Multilingual Education (MTB-MLE) in numeracy instruction for primary learners. The following questions were addressed through the examination of the teachers' lived experiences:

1. How do SPES teachers perceive the impact of Mother Tongue-Based Multilingual Education (MTB-MLE) on numeracy skill development among key stage 1 learners?
2. What strategies do SPES teachers employ to develop numeracy skills using MTB-MLE?
3. What challenges do SPES teachers encounter in developing numeracy skills through MTB-MLE?
4. How do SPES teachers contextualize, translate, and localize numeracy instruction within MTB-MLE?
5. What role do MTB-MLE teachers play in formulating learner assessments to enhance numeracy skills?
6. What enhanced school-based MTB-MLE for Key Stage 1 learners can be proposed to improve their numeracy skills?

Population and Samples

This study employed purposive sampling which was considered as the most suitable strategy for phenomenological studies (Pathak, 2017). Also known as judgment, selective, or subjective sampling, this approach relied on the researcher's judgment to select participants who are best suited for the study. Hayes and Singh (2011) emphasized that purposive sampling is ideal for obtaining rich, detailed responses through interviews, particularly when the aim is to explore participants' experiences deeply. According to Englander, this non-probability sampling method allowed researchers to choose participants with relevant experiences, ensuring that the study's findings are meaningful and relevant.

Unlike quantitative research, where sample size often correlates with the quality of data, qualitative research prioritizes the richness of information. Englander and Van Manen (2012) asserted that the effectiveness of phenomenological research depends more on the depth of the participants' experiences than on the number of participants. Van Manen (2014) cautions against conducting excessive interviews, which might lead to superficial insights due to selective emphasis on factors like sample size, gender, or ethnicity. Consequently, the researcher focused on a single district and specifically targeted key stage 1

teachers who use MTB-MLE in their mathematics instruction. Out of the 30 initially targeted teachers, only 14 participated, as 9 declined and 7 did not attend the scheduled group interviews or focus group discussions despite confirming their availability.

Grade Level	Target	Actual
Grade 1 Teachers	10	5
Grade 2 Teachers	10	5
Grade 3 Teachers	10	4
TOTAL	30	14

Table A. The Participants

Instrumentality

Instrumentality in qualitative research is essential as it shapes the entire process of data collection, analysis, and interpretation. It refers to the tools, methods, and approaches researchers use to gather meaningful insights into participants' experiences, behaviors, or perceptions. A well-chosen instrument, such as interviews, focus group discussions, or observation, ensures that the data collected are rich, detailed, and relevant to the research questions. The importance of instrumentality lies in its ability to capture the depth and complexity of human experiences, making it possible to uncover nuanced themes that may not emerge through quantitative methods. It also allows researchers to remain flexible and responsive to participants' needs, adjusting instruments to better fit the study's context.

Hayes and Singh (2011) noted that phenomenologists often favor interviews as a method for exploring human experiences and investigating both underexplored and novel social phenomena. According to Englander (2012), the phenomenological interview process involves posing broad questions that prompt a dialogue, encouraging participants to share rich and detailed narratives of their experiences. In this approach, the researcher plays a pivotal role, effectively guiding the interview to elicit comprehensive and relevant information from participants.

For the current study, a semi-structured interview questionnaire or guide was employed to gather insights into the participants' experiences. The researcher created a relaxed conversational environment to help interviewees feel comfortable and open in sharing their information. In alignment with this approach, the researcher employed both focus group discussions to gather comprehensive insights into the experiences of teachers teaching mathematics using Mother Tongue-Based Multilingual Education (MTB-MLE). Specifically, the researcher conducted separate interviews with 5 teachers from Grade 1, 5 teachers from Grade 2, and 4 teachers from Grade 3. This is for in-depth perspectives and collective discussions, enhancing the richness of the data collected. By using the right instruments effectively, researchers enhance the credibility, validity, and rigor of their findings, ultimately leading to more accurate and impactful conclusions in qualitative research.

Informed Consent

The researcher ensured that all participating teachers completed the informed consent process to uphold ethical standards. Research often presents ethical challenges. According to Nnebue (2010), research must uphold the dignity and integrity of all participants. He emphasizes that participants must be fully informed about the study's purpose and their role in it, with participation being voluntary and free from coercion or manipulation. Informed consent is a fundamental requirement, involving clear communication about the

study's nature, methods, and participants' rights.

Nnebue (2010) also asserted that research should adhere to moral and societal norms, even with participant consent, and should not exploit participants' ignorance or mental incompetence. To maintain ethical standards, the researcher will rigorously follow informed consent procedures, ensuring that participants understand their involvement and that their privacy is protected. The informed consent form for this study outlines the research purpose, participant expectations, and researcher contact information. It also clearly states that participants have the right to withdraw from the study at any time and to request the removal of their data from the research.

Informed consent is a cornerstone of ethical qualitative research, ensuring that participants are fully aware of the nature, purpose, and potential implications of the study before agreeing to take part. It establishes trust between researchers and participants by giving individuals the autonomy to decide whether or not they want to participate based on a clear understanding of what their involvement entails. In qualitative research, where personal experiences, opinions, and emotions are often explored in depth, obtaining informed consent is crucial to safeguarding participants' rights and privacy. It involves explaining the research objectives, methods, potential risks, benefits, and the participant's right to withdraw at any point without consequence. Informed consent also ensures transparency about how data will be collected, used, stored, and shared, which is particularly important in maintaining confidentiality. By obtaining consent, researchers respect the dignity and autonomy of participants, fostering ethical rigor and protecting the integrity of the research process.

Confidentiality

Confidentiality is essential in research to protect participants' privacy by keeping their personal information and responses private, which encourages honest participation and aligns with ethical standards. It prevents potential harm that could arise from exposing sensitive data, fosters trust between researchers and participants, and ensures compliance with legal and institutional requirements. By maintaining confidentiality, researchers uphold ethical principles, safeguard participants from harm, and enhance the overall integrity and credibility of the research.

Confidentiality is of paramount importance in qualitative research as it ensures the privacy and protection of participants' identities and personal information. In qualitative studies, researchers often gather sensitive, in-depth data through interviews, focus groups, or observations, which may include participants' opinions, personal experiences, and emotions. Maintaining confidentiality builds trust between the researcher and participants, encouraging openness and honesty in sharing information. It also protects participants from potential harm, such as social, emotional, or professional repercussions, that could arise if their identities or responses were disclosed. By safeguarding confidentiality, researchers uphold ethical standards, promote voluntary participation, and ensure the integrity of the research process.

This research ensured the anonymity of participants and the confidentiality of their information. Confidentiality requires that participants' names and identifying characteristics remain undisclosed. Hayes and Singh (2011) emphasize that participants' identities and communications should remain confidential even beyond the study period. To protect participants' identities, the researcher will use pseudonyms or numerical identifiers in presenting results and findings.

Confidentiality also involves safeguarding all research records. All materials, including personal information, signed consent forms, interview recordings, transcripts, and consolidated responses, will be securely stored in a fire-proof safe. These records will be retained for three years after the study's

completion, after which they will be disposed of through incineration or shredding to ensure full confidentiality.

Pilot Study

To validate the research instrument, the researcher conducted a pilot interview, as recommended by Percy et al. (2015), who highlighted the increasing preference for qualitative methods to explore individuals' subjective experiences, opinions, and beliefs. Unlike quantitative research, which often relies on the effectiveness of research or survey instruments, qualitative research positions the researcher as the primary tool for data collection, using interviews to gain an in-depth understanding of participants (Meriam, 2016). A pilot study or interview before the actual data gathering in qualitative research is essential for ensuring the effectiveness and reliability of the research design. It allows researchers to test and refine their data collection tools, such as interview questions or focus group guides, ensuring they are clear, relevant, and capable of eliciting rich, meaningful responses. Conducting a pilot study helps identify potential issues, such as ambiguous questions, interviewer biases, or logistical challenges, which can be addressed before the full-scale research begins. This preliminary phase also allows researchers to familiarize themselves with the dynamics of the interview process and build rapport with participants, which can enhance the quality of data collected later. Additionally, it helps in validating the appropriateness of the sampling strategy and ensures that the research methods align with the study's objectives.

Castillo-Montoya (2016) emphasized that piloting interview protocols is crucial for identifying and addressing any flaws or limitations in the interview design, allowing for necessary refinements to improve the interview guide and study methodology. In this study, pilot interviews were conducted with key stage 2 teachers at Sorsogon Pilot Elementary School. Nine teachers, three from each of grades 4, 5, and 6, participated in a group interview. The feedback from these pilot interviews validated the interview guide and provided valuable insights for developing follow-up questions, ensuring that the final instrument effectively captured the intended information.

Validity

Validity in qualitative research is essential for ensuring that the study's findings are trustworthy, credible, and accurately reflect the participants' experiences and perspectives. It ensures that the research process is rigorous and that the data collected truly represent the reality being studied, rather than being influenced by the researcher's biases or assumptions. Validity is achieved through strategies such as triangulation, member checking, and rich, detailed descriptions, which help to confirm that the conclusions drawn are grounded in the data. In qualitative research, where subjective interpretation plays a significant role, maintaining validity is critical to demonstrating that the study’s findings are not only meaningful but also transferable to similar contexts. Applebaum (2013) highlighted the importance of being aware of personal biases in phenomenological research, particularly when exploring human experiences. This caution is crucial for ensuring validity, which also entails rigor and reliability in the study. In the context of this research, which examines the development of numeracy skills using MTB-MLE, the researcher took significant steps to address these concerns.

Validity in this study involves accurately capturing and interpreting the lived experiences of teachers and learners, while rigor pertains to thoroughly understanding and representing these experiences without letting personal biases distort the findings. According to van Manen (2014), achieving validity in hermeneutic phenomenology involves setting aside preconceptions and biases to truly grasp the essence of the experiences. To ensure rigor, Hayes and Singh (2011) emphasized the importance of capturing participants' voices authentically and eliminating any assumptions that could compromise the study's

credibility. Reliability, on the other hand, is achieved through a process of reduction, where the researcher actively engages with the interview texts to uncover the underlying realities of the participants' experiences (Errasti-Ibarrondo et al., 2018). This present study ensured reliability by meticulously analyzing interview transcripts to identify and validate emergent themes, thereby enhancing the trustworthiness of the findings in understanding how MTB-MLE impacts numeracy development.

Qualitative Data Analysis

Effective qualitative analysis is essential in a phenomenological study as it allows researchers to deeply explore and understand the lived experiences of participants. Phenomenological research aims to capture the essence of these experiences, focusing on how individuals perceive and make sense of their world. By employing rigorous and thoughtful qualitative analysis, researchers can identify patterns, themes, and meanings that emerge from participants' narratives, providing a rich and nuanced understanding of the phenomenon being studied. This process involves immersing oneself in the data, engaging in reflective interpretation, and ensuring that the analysis remains true to the participants' perspectives.

Englander (2012) emphasized the importance of broad, open-ended questions in phenomenological interviews to elicit detailed narratives. The researcher used a semi-structured interview questionnaire to guide these conversations, aiming to create a relaxed and conversational atmosphere that encouraged teachers to share their experiences openly. Recorded interviews were transcribed to ensure an accurate representation of the participants' responses. Following the method of phenomenological reduction described by Pettigrew (2013), the researcher bracketed the data to analyze it holistically, categorizing responses into meaningful units to identify emergent themes related to the implementation of MTB-MLE in mathematics instruction.

Van Manen (2014) discussed the role of writing in phenomenological research as a means to articulate and clarify the depth of experiences. Effective qualitative analysis enhances the credibility, validity, and reliability of the study, ensuring that findings are well-grounded in participants' experiences and not shaped by researcher bias. In this study, the researcher's transcriptions and subsequent analysis aimed to make the teachers' experiences with MTB-MLE visible and comprehensible. By maintaining a reflective stance throughout the analysis, the researcher ensured rigorous interpretation of the data, ultimately producing a detailed and nuanced understanding of how MTB-MLE impacts mathematics teaching.

CHAPTER IV
PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

This chapter presents the findings of the study based on the insights gathered from the teacher-respondents. The data were thoroughly analyzed to derive accurate conclusions and recommendations. The results are organized chronologically, reflecting the scope and depth of the participants' shared experiences regarding the perceptions of teachers at Sorsogon Pilot Elementary School (SPES) on the impact of Mother-Tongue-Based Multilingual Education (MTB-MLE) on the numeracy skills development of Key Stage 1 learners, from kindergarten to Grade 1.

The researcher explored the strategies employed by teachers, along with the challenges they face in implementing these strategies. Additionally, the study examined how teachers contextualize, translate, and localize numeracy instruction within the MTB-MLE framework. It also investigated the teachers' perceptions of the role of assessment in enhancing numeracy skills. Finally, this chapter introduces a researcher-developed MTB-MLE capacity-building program, detailing activities focused on improving the numeracy skills of Key Stage 1 learners.

1. Teachers' Perception on the Impact of Mother-Tongue-Based Multilingual Education (MTB-MLE) on Numeracy Skills Development among Key Stage 1 Learners

Teachers' perceptions are pivotal in determining the effectiveness of a teaching approach, as their insights and attitudes can significantly impact both its implementation and learner engagement. When teachers view a method as beneficial and aligned with their learners' needs, they are more likely to adopt it wholeheartedly, adjusting strategies to maximize its success. In this study, teachers identified Mother-Tongue-Based Multilingual Education (MTB-MLE) as a valuable approach for enhancing numeracy skills among early-grade learners. From the teachers' perceptions, five key themes emerged, highlighting their experiences and perspectives on the role of MTB-MLE in numeracy instruction.

Teachers' perceptions play a crucial role in the success of any educational approach, as their insights and attitudes can significantly influence both the implementation of the method and the engagement of learners. When teachers believe that a particular method is beneficial and meets the needs of their learners, they are more likely to embrace it fully, making necessary adjustments to ensure its effectiveness. In this study, teachers recognized Mother-Tongue-Based Multilingual Education (MTB-MLE) as an effective strategy for improving numeracy skills among young learners. Their perceptions revealed several important aspects of how MTB-MLE impacts numeracy instruction.

Firstly, teachers observed that using the mother tongue as the medium of instruction greatly enhance learners' comprehension of mathematical concepts. This approach allow learners to better understand and relate to the material, leading to increased engagement and participation in lessons. Learners are more confident in expressing their thoughts and solving problems when taught in their native language, which also encourage them to ask questions and share their ideas more freely.

Additionally, MTB-MLE help bridge the language barriers that often hinder learning in a second language. Teachers find that learners could grasp numeracy skills more quickly and effectively when instruction is delivered in their first language. This not only facilitates better understanding but also made learning more meaningful by incorporating cultural references and familiar contexts. As a result, learners could relate to examples and problems presented in their mother tongue, leading to a deeper understanding of numeracy concepts.

Moreover, implementing MTB-MLE required teachers to adapt their teaching strategies, which include developing new materials and methods tailored to their learners' linguistic and cultural backgrounds. This adaptation process also contribute to teachers' professional growth, as they engage in continuous learning and collaboration to enhance their instructional practices. The study highlights that the successful implementation of MTB-MLE benefited learners and fostered a culture of innovation and professional development among teachers.

The study highlights several emerging concepts regarding the role of Mother-Tongue-Based Multilingual Education (MTB-MLE) in developing numeracy skills among early-grade learners. Teachers perceive MTB-MLE as both demanding and gratifying, indicating that despite the challenges, there is a significant sense of satisfaction and fulfillment derived from teaching mathematics in the mother tongue. This approach is seen as beneficial because it aligns with the learners' needs, making the learning process more engaging and effective.

Enjoyment and Fulfillment

The responses of the teachers interviewed indicate that teaching mathematics with MTB-MLE is perceived as both demanding and gratifying. Participant 1 described the experience as *"hard but enjoying,"* suggesting that despite the difficulties, there is a sense of satisfaction. Participant 2 echoed this sentiment,

calling it a *"challenging and rewarding task,"* highlighting the fulfillment derived from overcoming obstacles. Similarly, Participant 5 found the process *"challenging and fulfilling,"* reflecting a sense of achievement from successfully navigating the complexities of MTB-MLE.

Although there are challenges, many teachers still find enjoyment in their work. Participant 10 described their experience as *"enjoyable and interesting,"* particularly when teaching fundamental skills like reading and counting. Participant 11 also found teaching to be *"easy and interesting,"* highlighting the positive aspects of the job. Participant 13 emphasized making math engaging through real-world examples and hands-on activities, noting the importance of making math *"fun and relatable."*

The teachers' responses reveal that teaching mathematics with MTB-MLE, while challenging, brings a deep sense of satisfaction and fulfillment. The process is seen as demanding yet rewarding, with teachers finding joy in overcoming obstacles and making math engaging through real-world examples and hands-on activities. This duality of challenge and enjoyment underscores the importance of innovative teaching methods that make learning both effective and enjoyable.

In a study on the academic achievement of Peruvian Indigenous children, Hynsjö and Damon (2015) found that teaching content subjects in the mother tongue resulted in higher test scores compared to instruction in a second language. They also observed that children engaged more actively with their teachers when taught in their familiar language. Similarly, Hazik and Farik (2016) conducted research in Fiji and found that children learn mathematical concepts more effectively when taught in their home language. Their study revealed that children enjoyed learning mathematics more when the teaching aids were familiar to them. By incorporating elements from the children's cultural backgrounds, mathematical ideas, and concepts were more easily understood and retained.

Teachers' perceptions of teaching mathematics through Mother-Tongue-Based Multilingual Education (MTB-MLE) reveal a blend of challenges and rewards. Despite the demanding nature of this approach, many teachers find it deeply satisfying. For instance, one teacher described the experience as "hard but enjoying," indicating that the difficulties encountered are balanced by a sense of enjoyment and accomplishment. Another teacher echoed this sentiment, referring to the task as both "challenging and rewarding," which underscores the fulfillment derived from overcoming obstacles and achieving success in teaching.

The sense of achievement is a common theme among teachers who navigate the complexities of MTB-MLE. One teacher found the process "*challenging and fulfilling*," reflecting the satisfaction that comes from successfully implementing this educational approach. Despite the inherent challenges, many teachers still derive enjoyment from their work. For example, one teacher described their experience as "*enjoyable and interesting*," particularly when teaching fundamental skills like reading and counting. Another teacher found the job "*easy and interesting*," highlighting the positive aspects of teaching and the joy it brings.

Teachers find enjoyment in their work, especially when they can make math fun and relatable through real-world examples and hands-on activities. Teachers' perceptions indicate that using the mother tongue as the medium of instruction enhances comprehension, engagement, confidence, and cultural relevance in learning. The approach also necessitates teacher adaptation and professional growth, ultimately contributing to the overall effectiveness of the educational method. Moreover, teachers emphasize the importance of making mathematics engaging and relatable for learners. One teacher noted the significance of using real-world examples and hands-on activities to make math "*fun and relatable*." This approach not only enhances learner engagement but also makes learning more meaningful and enjoyable.

Enjoyment and fulfillment emerged as a prominent theme in the interview responses regarding teachers' perceptions of the impact of Mother-Tongue-Based Multilingual Education (MTB-MLE) on the development of numeracy skills among Key Stage 1 learners. Teachers expressed a sense of satisfaction when they witnessed learners engaging with numeracy concepts in their mother tongue, as this approach not only made learning more relatable but also fostered a positive and enjoyable classroom environment. Many teachers noted that when learners could connect numeracy skills to their cultural contexts, it enhanced their motivation and interest in mathematics, leading to a more vibrant and dynamic learning experience. The use of familiar language and culturally relevant examples not only eased learners' anxieties but also empowered them to take an active role in their learning. This enjoyment translated into a greater sense of fulfillment for teachers, as they felt their efforts in implementing MTB-MLE were yielding tangible benefits in learner engagement and understanding, reinforcing their commitment to this pedagogical approach.

Enhanced Understanding and Clarity

Teachers generally perceive MTB-MLE as beneficial for improving understanding. Participant 1 stated that MTB-MLE *"should help better understanding for learners on their lessons,"* and Participant 5 noted that it *"made an impact to learners that were slow using mother tongue (which) made the lesson easier to understand."* Participant 5 noted, *"It made an impact on learners that were slow; using Mother Tongue makes the lesson easier to understand."* This suggests that MTB-MLE can enhance engagement and comprehension by providing familiar linguistic tools.

Participant 7 affirmed its effectiveness saying, "They can easily understand the concept because I use the first language/dialect." Participant 8 highlighted that MTB-MLE allows learners to *"understand well the lesson using their language,"* while Participant 9 observed that it *"makes the lesson much easier to understand because of Language 1."* Participant 10 emphasized that MTB-MLE *"helps a lot to learners to understand well the concept of numeracy."* She added, *"It helps a lot to learners to understand well the concept of numeracy,"* emphasizing that learners grasp mathematical concepts more easily when taught in their native language.

Additionally, Participant 13 pointed out that it *"improves their performance and makes them more likely to complete their education"* by connecting math concepts with their daily lives through their native language. These perspectives reflect a strong consensus among teachers that MTB-MLE significantly enhances clarity and understanding in numeracy instruction.

On the other hand, Participant 12 stated, *"As a teacher, I do not translate it into localized dialect when teaching mathematics because it will be confusing to them."* This response highlights the complexity of translation and the importance of clarity in instruction. Participant 14 said, *"I use many languages such as English, Filipino, and MTB."* This approach promotes a multilingual environment that recognizes and respects the linguistic diversity of learners, allowing them to draw on various languages to support their learning.

Teaching mathematical concepts become challenging for teachers when learners struggle to comprehend the medium of instruction. Similarly, learners find it frustrating to engage in activities they do not fully understand. Participants indicated that the translation process might not always be direct. Participant 10 explained, *"Sometimes word for word, but most of the time by idea or concept."* This reflects a nuanced understanding of language, acknowledging that concepts may not translate neatly between languages and may require a focus on the underlying ideas.

The teachers' insights into MTB-MLE reveal a complex interplay between language and learning. They highlight the significant benefits of using the mother tongue in enhancing learners' comprehension and engagement. By teaching in a familiar language, learners can grasp mathematical concepts more easily, which in turn improves their performance and likelihood of completing their education. This approach also makes lessons more relatable by connecting them to learners' daily lives.

However, the process is not without its challenges. The complexity of translating mathematical concepts into local dialects can sometimes lead to confusion, underscoring the importance of clarity in instruction. The use of multiple languages in the classroom, as noted by some teachers, reflects an adaptive strategy to cater to the linguistic diversity of learners. This multilingual approach can support learning by allowing learners to draw on various linguistic resources.

Participant 1 emphasized the importance of using simple or common language to facilitate learning, making lessons more approachable for learners who might struggle with complex vocabulary. As Mudenda (2017), cited by Puno et al. (2023), emphasized, effective communication requires a common language to ensure that messages are accurately received and understood. When learners can complete tasks successfully, they experience greater enjoyment and fulfillment. Supporting this view, Villaruz and Perez (2020) highlighted that studies on MTB-MLE in the Philippines often favor its outcomes compared to other approaches. For example, a study conducted in Palawan with indigenous learners revealed that while exposure to the mother tongue, Filipino, and English was part of the instruction, only the use of the mother tongue demonstrated a significant impact on learners' performance in Science and Mathematics. This current study aligns with these findings, as most teacher-participants observed that learners performed better and more efficiently when instruction was provided in their mother tongue, in this case, the Bicol language.

Teachers generally perceive Mother-Tongue-Based Multilingual Education (MTB-MLE) as highly beneficial for enhancing learners' understanding. One teacher noted that MTB-MLE should help learners better grasp their lessons, while another observed that it significantly impacted slower learners by making lessons easier to comprehend. The effectiveness of using the first language or dialect in teaching was affirmed by another teacher, who mentioned that learners could easily understand concepts when taught in their native language. This sentiment was echoed by another teacher who highlighted that MTB-MLE allows learners to understand lessons well using their language.

Another teacher pointed out that using the mother tongue makes lessons much easier to understand, particularly in numeracy, where it helps learners grasp concepts more effectively. Additionally, one teacher emphasized that MTB-MLE improves learners' performance and increases their likelihood of completing their education by connecting math concepts with their daily lives through their native language. These perspectives collectively reflect a strong consensus among teachers that MTB-MLE significantly enhances clarity and understanding in numeracy instruction.

Teaching mathematical concepts becomes particularly challenging for teachers when learners struggle to comprehend the medium of instruction. Learners, in turn, find it frustrating to engage in activities they do not fully understand. Effective communication, as emphasized by Mudenda (2017) and cited by Puno et al. (2023), requires a common language to ensure that messages are accurately received and understood. When learners can complete tasks, they experience greater enjoyment and fulfillment. Supporting this view, Villaruz and Perez (2020) highlighted that studies on MTB-MLE in the Philippines often favor its outcomes compared to other approaches. For instance, a study conducted in Palawan with Indigenous learners revealed that while instruction included exposure to the mother tongue, Filipino, and English,

only the use of the mother tongue had a significant impact on learners' performance in Science and Mathematics. This current study aligns with these findings, as most teacher-participants observed that learners performed better and more efficiently when instruction was provided in their mother tongue, specifically the Bicol language.

Enhanced understanding and clarity emerged as a prominent theme from the interview responses regarding teachers' perceptions of the impact of Mother-Tongue-Based Multilingual Education (MTB-MLE) on numeracy skills development among Key Stage 1 learners. Teachers noted that when instruction was delivered in learners' mother tongue, learners demonstrated a greater ability to grasp mathematical concepts and terminology, leading to improved comprehension of numeracy skills. This linguistic familiarity not only facilitated clearer communication of ideas but also allowed learners to engage with lessons more meaningfully. Teachers emphasized that using MTB-MLE helped demystify complex mathematical concepts, enabling learners to approach problem-solving with confidence. Moreover, the integration of culturally relevant examples and contexts enriched the learning experience, fostering a deeper connection to the material. As a result, teachers observed significant improvements in learner engagement and performance, highlighting the effectiveness of MTB-MLE in promoting enhanced understanding and clarity in numeracy instruction.

The use of MTB-MLE in teaching mathematics is perceived by teachers as a powerful tool for improving learners' understanding and performance. The approach not only makes lessons easier to comprehend but also enhances learners' engagement and enjoyment in learning. Research supports these observations, demonstrating that instruction in the mother tongue leads to better academic outcomes and a more fulfilling educational experience for learners.

Challenges and Confusion

Despite the perceived effectiveness of mother tongue in numeracy instruction, challenges remain, particularly regarding the translation of mathematical terminology. Teachers report several challenges that impact the effectiveness of this approach. Participant 1 observed that "Children have difficulties in writing the names of each number in Mother Tongue. Participant 2 noted that *"during your class discussion, you will notice that some of your learners are difficult in understanding,"* reflecting struggles with comprehension.

Some teachers expressed concerns about difficulties translating mathematical concepts into the Mother Tongue. Participant 4 said, *"It is difficult to translate numbers in MTB and also the mathematical terms used."* This reflects a challenge with MTB-MLE, as not all mathematical terms have direct translations, which can make it harder for both teachers and learners. She highlighted difficulties with emergent learners who struggle with basic numeracy skills, stating, *"Difficult especially in our class emergent/FR learners, they can't count and identify numbers."* The participant expressed a sense of urgency when discussing the challenges related to "translating numbers in MTB and the mathematical terms used." This highlights that both language barriers and specific terminological issues significantly hinder effective mathematics instruction. Her emphasis underscored the need to address these linguistic challenges to improve teaching strategies and enhance learners' understanding of mathematical concepts.

Participant 6 noted, *"Sometimes it is quite confusing on their parts regarding some terminologies."* This highlights a potential drawback of MTB-MLE: while it aids in overall comprehension, certain mathematical vocabulary may still confuse learners when translated into their Mother Tongue. Participant 6 added that *"sometimes it is quite confusing on their parts regarding some terminologies,"* indicating that inconsistencies in terminology contribute to learner confusion. Similarly, participant 8 and Participant 9

also expressed frustration with the language barriers, stating that teaching is "*very hard and challenging*" due to the *"different languages of children"* and the difficulty in understanding MTB terminology. Furthermore, Participant 14 remarked that *"using MTB in teaching Math is hard,"* which underscores the broader difficulties associated with integrating MTB-MLE effectively. These responses collectively illustrate the various challenges and sources of confusion that teachers face when implementing MTB-MLE, emphasizing the need for improved resources and support to address these issues.

The teachers' insights into MTB-MLE reveal a complex interplay between language and learning. They highlight the significant benefits of using the mother tongue in enhancing learners' comprehension and engagement. By teaching in a familiar language, learners can grasp mathematical concepts more easily, which in turn improves their performance and likelihood of completing their education. This approach also makes lessons more relatable by connecting them to learners' daily lives.

However, the process is not without its challenges. The complexity of translating mathematical concepts into local dialects can sometimes lead to confusion, underscoring the importance of clarity in instruction. The use of multiple languages in the classroom, as noted by some teachers, reflects an adaptive strategy to cater to the linguistic diversity of learners. This multilingual approach can support learning by allowing learners to draw on various linguistic resources.

The nuanced understanding of language translation, where teachers focus on conveying ideas or concepts rather than direct word-for-word translation, further illustrates the intricate nature of teaching mathematics with MTB-MLE. This method acknowledges that concepts may not always translate neatly between languages, requiring a more flexible and conceptual approach to instruction.

Despite the perceived effectiveness of mother tongue in numeracy instruction, challenges remain, particularly regarding the translation of mathematical terminology. Teachers report several challenges that impact the effectiveness of this approach. Participant 1 observed that *"Children have difficulties in writing the names of each number in Mother Tongue*." Participant 2 noted that *"during your class discussion, you will notice that some of your learners are difficult in understanding,"* reflecting struggles with comprehension.

Some teachers expressed concerns about difficulties translating mathematical concepts into the Mother Tongue. Participant 4 said, *"It is difficult to translate numbers in MTB and also the mathematical terms used."* This reflects a challenge with MTB-MLE, as not all mathematical terms have direct translations, which can make it harder for both teachers and learners. She highlighted difficulties with emergent learners who struggle with basic numeracy skills, stating, "*Difficult especially in our class emergent/FR learners, they can't count and identify numbers."* The participant expressed a sense of urgency when discussing the challenges related to *"translating numbers in MTB and the mathematical terms used."* This highlights that both language barriers and specific terminological issues significantly hinder effective mathematics instruction. Her emphasis underscores the need to address these linguistic challenges to improve teaching strategies and enhance learners' understanding of mathematical concepts.

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terminology. Furthermore, Participant 14 remarked that "*using MTB in teaching Math is hard,"* which underscores the broader difficulties associated with integrating MTB-MLE effectively. These responses collectively illustrate the various challenges and sources of confusion that teachers face when implementing MTB-MLE, emphasizing the need for improved resources and support to address these issues.

Since the implementation of the MTB-MLE policy, several studies have investigated its challenges. Tundag et al. (2020) highlighted that translating mathematical concepts into the mother tongue has been a significant issue, while providing exercises and activities was identified as a moderate problem at a school in Dumaguete, Philippines. Similarly, Lartec et al. (2014) reported that the absence of mother tongue textbooks, insufficient vocabulary, and a lack of teacher training were major difficulties faced by teachers at another school in the Philippines.

In the Philippine context, the mother tongue often functions as a secondary language for learners, as English mathematical terms are commonly used at home instead of their native languages. This language discrepancy can lead to a loss of interest and engagement among learners due to confusion. Additionally, transfer learners who speak different first languages often face difficulties in understanding lessons and participating actively (Casalan et al., 2016, as cited in Baquiller & Abellon, 2021).

Despite the perceived effectiveness of using the mother tongue in numeracy instruction, several challenges persist, particularly in translating mathematical terminology. Teachers have reported various issues that impact the success of this approach. One teacher observed that children struggle with writing the names of numbers in their mother tongue, indicating a fundamental difficulty in basic numeracy skills. Another teacher noted that some learners find it hard to understand lessons during class discussions, reflecting broader comprehension issues. This struggle is particularly pronounced among emergent learners who have difficulty counting and identifying numbers. Additionally, the challenge of translating numbers and mathematical terms into the mother tongue further complicates the teaching process, as both language barriers and specific terminological issues arise.

Inconsistencies in terminology can lead to confusion among learners, as highlighted by another teacher who mentioned that certain terminologies can be quite confusing for learners. This confusion is exacerbated by the diverse linguistic backgrounds of the learners, making it very hard and challenging to teach using MTB-MLE. The difficulty in understanding MTB terminology is a common frustration among teachers, as expressed by several participants. One teacher remarked that using MTB in teaching math is particularly hard, underscoring the broader difficulties associated with effectively integrating MTB-MLE into the curriculum. These responses collectively illustrate the various challenges and sources of confusion that teachers face when implementing MTB-MLE, emphasizing the need for improved resources and support to address these issues.

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Additionally, transfer learners who speak different first languages often face difficulties in understanding lessons and participating actively.

The study revealed that teachers generally perceive Mother-Tongue-Based Multilingual Education (MTB-MLE) as beneficial for improving understanding among early-grade learners. They believe that using the mother tongue in instruction helps learners grasp lessons more effectively, making the learning process clearer and more relatable. This approach not only enhances comprehension but also fosters a more engaging and enjoyable learning environment. Teachers find that when learners understand the medium of instruction, they are more likely to participate actively and perform better academically. However, challenges remain, particularly in translating mathematical terminology into the mother tongue. Teachers report difficulties with learners struggling to write and understand mathematical terms in their native language, leading to confusion and frustration. The lack of adequate resources, such as textbooks and teacher training, further exacerbates these challenges.

The theme of Challenges and Confusion emerged prominently from the interview responses regarding teachers' perceptions of the impact of Mother-Tongue-Based Multilingual Education (MTB-MLE) on numeracy skills development among Key Stage 1 learners. Many teachers expressed concerns about the difficulties that arise in translating mathematical terminology from English to the mother tongue, which sometimes leads to confusion among learners. Teachers noted that while MTB-MLE aims to enhance comprehension, some learners still struggle to grasp concepts due to the unfamiliarity of certain terms in their native language. Additionally, teachers highlighted the challenge of addressing diverse linguistic backgrounds within the classroom, as some learners demonstrate proficiency in languages other than their mother tongue. This linguistic diversity can create disparities in understanding, making it challenging for teachers to implement effective instruction that resonates with all learners.

Despite these issues, the consensus is that MTB-MLE significantly improves numeracy skills by making mathematical concepts more accessible and relevant to learners' daily lives. This aligns with findings from other studies, which show that instruction in the mother tongue leads to better academic performance and higher engagement levels among learners. While MTB-MLE has its benefits, the challenges associated with translating mathematical terminology and the diverse linguistic backgrounds of learners highlight the need for better resources, training, and support for teachers to effectively implement this approach.

Positive Impact on Learning

Despite the challenges associated with using the mother tongue as the medium of instruction, many still assert that it has a positive impact on learning, including in mathematics. Participant 7 noted that *"the impact of MTB-MLE in the teaching and learning is to uplift the numerates,"* indicating that the approach helps improve numeracy skills. Participant 10 observed that learners were able to *"grasp the idea of mathematical situations/problems since it could be translated in their MTB."* This demonstrates how MTB-MLE can be particularly effective in helping learners understand word problems when they are contextualized in the Mother Tongue.

Similarly, Participant 12 observed that MTB-MLE *"improves their performance and makes them more likely to complete their education,"* suggesting that learning in the mother tongue not only enhances academic achievement but also contributes to greater educational persistence. These responses underscore the positive influence of MTB-MLE on learners' learning outcomes, illustrating its effectiveness in fostering academic growth and engagement.

Teachers mentioned that using MTB-MLE allows learners to solve word problems more effectively. Participant 3 shared, *"For instance, in solving word problems, they can comprehend enough because the*

questions are also contextualized." This points to MTB-MLE helping learners relate mathematical problems to their everyday experiences, thus improving problem-solving abilities. Some teachers indicated that MTB-MLE improves overall academic outcomes. Participant 12 said, *"It improves their performance and makes them more likely to complete their education,"* highlighting that using the Mother Tongue supports learners in building a solid foundation for future academic success.

Toquero (2010) concluded that using the mother tongue to teach basic mathematical concepts and operations lays a solid foundation for understanding and mastering more advanced mathematics. This approach not only captures learners' interest but also acts as a springboard for introducing new mathematical concepts and principles, thereby deepening their comprehension of why certain mathematical processes function as they do. By using their native language, learners can better construct and articulate their understanding, which leads to more active engagement in the learning process. They can express their thoughts clearly and integrate new concepts with their existing knowledge.

Additionally, Falguera (2022) found a significant improvement in Grade 1 learners' mathematics performance following exposure to mother tongue-based instruction. This evidence highlights that using the mother tongue, along with well-designed activities, markedly enhances learner performance and confirms mother tongue-based instruction as an effective method for teaching and learning mathematics.

Despite the challenges associated with using the mother tongue as the medium of instruction, many teachers and researchers assert that it has a positive impact on learning, particularly in mathematics. One participant noted that the impact of Mother Tongue-Based Multilingual Education (MTB-MLE) in teaching and learning is significant in uplifting numeracy skills. This suggests that the approach helps improve learners' ability to understand and work with numbers. Another participant observed that MTB-MLE improves learners' performance and increases their likelihood of completing their education. This indicates that learning in the mother tongue not only enhances academic achievement but also contributes to greater educational persistence. These responses highlight the positive influence of MTB-MLE on learners' learning outcomes, illustrating its effectiveness in fostering academic growth and engagement.

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Additionally, Falguera (2022) found a significant improvement in Grade 1 learners' mathematics performance following exposure to mother tongue-based instruction. This evidence highlights that using the mother tongue, along with well-designed activities, markedly enhances learner performance. It confirms that mother tongue-based instruction is an effective method for teaching and learning mathematics. By facilitating a deeper understanding and greater engagement, this approach helps learners build a strong foundation in numeracy, which is crucial for their future academic success.

The theme of Positive Impact on Learning emerged prominently from the interview responses regarding teachers' perceptions of Mother-Tongue-Based Multilingual Education (MTB-MLE) and its effect on the development of numeracy skills among Key Stage 1 learners. Teachers consistently highlighted that instruction in learners' mother tongue significantly enhances their understanding of mathematical

concepts, leading to improved engagement and retention of knowledge. The use of familiar language allows learners to relate more easily to numeracy tasks, facilitating a deeper comprehension of abstract concepts. Moreover, teachers noted that learners exhibit greater confidence and participation in classroom activities when lessons are delivered in their first language, contributing to a positive learning environment. This thematic insight underscores the effectiveness of MTB-MLE in not only fostering numeracy skills but also in cultivating a more inclusive and supportive educational experience for young learners.

While there are challenges associated with implementing MTB-MLE, the positive impacts on learning, particularly in mathematics, are substantial. The use of the mother tongue in education not only improves learners' academic performance but also fosters a more inclusive and engaging learning environment. This approach helps learners connect new knowledge with their existing understanding, making learning more meaningful and effective.

Contextual and Real-Life Connection

Using the mother tongue helps learners connect mathematical concepts to their everyday experiences, making learning more relevant and engaging. Participants' responses underscore the importance of linking lessons to real-life situations to improve comprehension. Several teachers suggested using real-life examples to enhance relatability. For instance, Participant 6 mentioned, *"Employing localizing examples and providing real objects for better understanding."* This practical approach connects mathematical concepts to learners' everyday experiences, making them more relevant.

Participant 11 observed that MTB-MLE enables learners to integrate mathematical concepts with their daily lives, noting, *"Just fine when I was in the lower section.*" Similarly, Participant 13 highlighted the approach of *"making math fun and relatable,"* explaining, *"I often use real-world examples and hands-on activities to connect math to learners' everyday lives."* These insights illustrate how using the mother tongue and incorporating practical examples can significantly enhance learners' understanding and application of mathematical concepts. These insights suggest that teaching in the mother tongue facilitates a stronger connection between mathematical ideas and learners' personal experiences, leading to improved understanding and application of concepts. Using a familiar language makes math instruction more relevant and engaging, ultimately enhancing the learning experience.

Hazik & Farik (2016) demonstrated a direct relationship between culture and cognition, highlighting how one's way of life significantly influences their thought processes and behaviors. They argue that the constant exposure to certain elements in a child's environment can shape their thinking and worldview. Children often use the language of their play to make sense of their surroundings. In a related finding, Nolasco (2012), as cited by Alimi (2020), discovered that when learners effectively use and master their first language, whether in their immediate environment or throughout their country, they develop critical reasoning and problem-solving skills essential for lifelong learning.

Teachers' perceptions of Mother-Tongue-Based Multilingual Education (MTB-MLE) in numeracy instruction reveal both its strengths and challenges. While many of the SPES teachers find the approach demanding, they also describe it as rewarding, offering enhanced clarity and engagement for learners. The use of the mother tongue facilitates a deeper understanding of mathematical concepts by connecting lessons to real-life experiences and cultural contexts. However, challenges such as the translation of mathematical terms and inconsistencies in terminology highlight the need for improved resources and support.

Despite these difficulties, teachers believe that MTB-MLE has a positive impact on learners' numeracy skills, fostering better academic performance and increased engagement, particularly in the foundational stages of education. This study reaffirms the potential of MTB-MLE in enhancing mathematical understanding while underscoring the importance of addressing the challenges that teachers encounter in its implementation.

The use of the mother tongue as the medium of instruction in education, particularly in mathematics, has been shown to positively impact learning outcomes. This approach not only enhances academic achievement but also contributes to greater educational persistence. Teaching basic mathematical concepts in the mother tongue lays a solid foundation for understanding more advanced mathematics, capturing learners' interest and deepening their comprehension of mathematical processes. By using their native language, learners can better articulate their understanding and integrate new concepts with existing knowledge, leading to more active engagement in the learning process.

Additionally, using the mother tongue helps learners connect mathematical concepts to their everyday experiences, making learning more relevant and engaging. This method facilitates a stronger connection between mathematical ideas and learners' personal experiences, enhancing their understanding and application of concepts. The relationship between culture and cognition is also highlighted, showing how a child's environment influences their thought processes and behaviors. Despite challenges such as translating mathematical terms and inconsistencies in terminology, the overall impact of Mother-Tongue-Based Multilingual Education (MTB-MLE) on learners' numeracy skills is positive, fostering better academic performance and increased engagement, particularly in the foundational stages of education. This underscores the potential of MTB-MLE in enhancing mathematical understanding while highlighting the need for improved resources and support to address the challenges faced by teachers.

The study revealed that teachers perceive Mother-Tongue-Based Multilingual Education (MTB-MLE) as beneficial for improving understanding and engagement among early-grade learners. They believe that using the mother tongue in instruction helps learners grasp lessons more effectively, making the learning process clearer and more relatable. This approach not only enhances comprehension but also fosters a more engaging and enjoyable learning environment. Teachers find that when learners understand the medium of instruction, they are more likely to participate actively and perform better academically. However, challenges remain, particularly in translating mathematical terminology into the mother tongue, leading to confusion and frustration.

Contextual and real-life connections emerged as a prominent theme in the interview responses regarding teachers' perceptions of the impact of Mother-Tongue-Based Multilingual Education (MTB-MLE) on numeracy skills development among Key Stage 1 learners. Teachers emphasized the importance of integrating local contexts and familiar experiences into their numeracy instruction, which helped learners see the relevance of mathematical concepts in their everyday lives. By using examples that resonate with learners' cultural backgrounds and personal experiences, teachers reported that learners were more engaged and motivated to participate in lessons. This approach not only facilitated a deeper understanding of numeracy skills but also made learning more meaningful, as learners could relate mathematical problems to situations they encountered in their communities. The responses highlighted that contextualizing numeracy instruction through MTB-MLE not only supports academic achievement but also strengthens learners' connection to their language and culture, thereby fostering a holistic educational experience.

Despite the issues and challenges, the consensus is that MTB-MLE significantly improves numeracy skills by making mathematical concepts more accessible and relevant to learners' daily lives. This aligns with findings from other studies, which show that instruction in the mother tongue leads to better academic performance and higher engagement levels among learners.

2. Strategies Employed by SPES Teachers in Developing Numeracy Skills Using Mother-Tongue Based Multilingual Education (MTB-MLE)

To effectively utilize the benefits of mother tongue instruction in mathematics for primary-grade learners, teachers should adopt a variety of strategies. Feedback from 14 Key Stage 1 teachers highlighted six key themes, illustrating the different methods they use to enhance the development of numeracy skills in their learners.

Use of Manipulatives and Concrete Objects

Teachers highlighted various methods for incorporating physical materials to enhance understanding and engagement. Participant 2 emphasized the use of *"concrete samples of counters, like popsicle sticks,"* indicating a focus on tangible objects to help learners grasp mathematical concepts. This hands-on approach helps learners visualize mathematical concepts, making them more accessible and engaging. The use of real objects allows learners to explore and manipulate concepts, enhancing their understanding.

Similarly, Participant 5 mentioned employing *"games, puzzles, concrete examples, and manipulatives"* to make learning more interactive and accessible. This approach underscores the importance of providing learners with physical tools to visualize and practice mathematical ideas. Participant 6 highlighted the use of *"real objects/concrete objects,"* which aligns with the theme of using manipulatives to facilitate learning. This strategy helps bridge the gap between abstract mathematical concepts and learners' everyday experiences. Participant 9 also underscored the value of *"concrete examples/manipulation" alongside "games and puzzles,"* reinforcing the use of hands-on materials to support learning.

Participant 13 pointed out the integration of manipulatives in *"relating Math to everyday life,"* which demonstrates the application of physical materials to connect mathematical concepts with real-world contexts. Additionally, Participant 10 noted using a *"SMART way/based on their daily life experiences,"* suggesting that manipulatives are employed in ways that reflect learners' everyday realities. These responses collectively suggest that using manipulatives and concrete objects is a widely endorsed strategy for teaching mathematics in MTB-MLE settings. By incorporating tangible materials, teachers can enhance learners' understanding and engagement, making abstract concepts more relatable and easier to grasp.

Carbonneau, Marley, and Selig (2013) highlighted that simply using manipulatives is often insufficient for fostering meaningful learning. Without explicit instruction, children may not manipulate objects in ways that accurately represent the mathematical concepts being taught. This underscores the importance of delivering instruction in a language that is familiar and comprehensible to the learners. Ricablanca (2014) argued that learners' education should begin with the language they are most comfortable with, as this provides a solid foundation for learning. Supporting this view, Omonoyi et al. (2013) recommended that the mother tongue be used for teaching mathematics at the primary level, noting that it helps learners internalize mathematical language and develop a positive relationship with the subject from an early age.

The use of manipulatives and concrete objects emerged as a key theme from the interview responses regarding strategies employed by Sorsogon Pilot Elementary School (SPES) teachers in developing numeracy skills through Mother-Tongue-Based Multilingual Education (MTB-MLE). Teachers reported that incorporating physical tools, such as counters, blocks, and everyday items, significantly enhanced

learners' understanding of mathematical concepts. By allowing learners to engage with tangible materials, teachers observed that learners could visualize and better grasp abstract ideas like addition, subtraction, and measurement. This hands-on approach not only facilitated active participation but also enabled teachers to connect lessons to learners' cultural contexts by using locally relevant objects. Furthermore, the integration of manipulatives helped bridge language gaps, as learners could focus on the mathematical operations rather than struggling with unfamiliar terminology. Overall, the use of manipulatives and concrete objects was viewed as an effective strategy that fostered engagement, comprehension, and a more meaningful learning experience for learners within the MTB-MLE framework.

The use of manipulatives and concrete objects in teaching mathematics within the framework of Mother-Tongue Based Multilingual Education (MTB-MLE) is a key strategy for enhancing numeracy skills among primary-grade learners. This approach involves incorporating physical materials, such as counters, games, and puzzles, to make abstract mathematical concepts more tangible and relatable. By using these tools, teachers can bridge the gap between theoretical ideas and learners' everyday experiences, thereby fostering a deeper understanding and engagement with the subject.

However, the effectiveness of this method relies heavily on explicit instruction in a language that learners are comfortable with, ensuring that they can accurately manipulate and comprehend the mathematical concepts being taught. This strategy not only aids in the internalization of mathematical language but also helps develop a positive relationship with the subject from an early age, laying a solid foundation for future learning.

Differentiated Instruction and Activities

Teachers emphasized various strategies to cater to diverse learner needs and enhance learning outcomes. Participant 3 highlighted *"explicit teaching and differentiated instructions,"* underscoring the importance of tailoring instruction to meet individual learner needs. This strategy allows teachers to tailor their instruction to accommodate different learning styles and abilities, ensuring that all learners can engage with the material effectively. It ensures that each learner receives the appropriate level of support and challenge. Participant 7 also supported this theme by mentioning *"differentiated and practical works,"* which reflects the use of varied tasks to accommodate different learning styles and abilities.

Several teachers emphasized the importance of collaborative learning through grouping activities and peer interactions. Participant 1 mentioned using *"grouping activities, peer,"* highlighting the role of social interaction in learning numeracy. This approach encourages communication and shared understanding among learners, allowing them to learn from one another while Participant 8 described *"differentiated activities and games,"* further illustrating the application of differentiated instruction in engaging learners through diverse methods. This strategy allows teachers to address varying levels of understanding and promote more effective learning experiences. Participant 12 mentioned *"offering choice around how to demonstrate mastery both from a task and language perspective,"* which aligns with the theme of differentiation by providing learners with options that best suit their learning preferences and abilities. This flexibility helps to address individual differences and enhance learner engagement.

Researchers in various studies, including Hart et al. (2015) and Odicta (2017), have consistently found differentiated instruction to be an effective strategy for enhancing learner motivation and improving academic achievement, particularly in mathematics. Magsombol (2021) also concluded that the use of the mother tongue in teaching mathematics, specifically in solving word problems, proved to be effective. He suggested that word problems using the mother tongue could be utilized as activities for enrichment, drills, or practice, further supporting the positive impact of this approach on learning outcomes. The responses

of the 14 interviewees collectively indicated that differentiated instruction and activities are key strategies in MTB-MLE settings. By adapting teaching methods and materials to meet diverse learner needs, teachers can create more inclusive and effective learning environments. This approach not only supports various learning styles but also fosters a deeper understanding of mathematical concepts among all learners.

Differentiated instruction and activities emerged as a key theme in the interview responses regarding the strategies employed by Sorsogon Pilot Elementary School (SPES) teachers in developing numeracy skills through Mother-Tongue-Based Multilingual Education (MTB-MLE). Teachers highlighted the importance of tailoring their instructional approaches to meet the diverse needs of their learners, recognizing that learners come with varying levels of proficiency in their mother tongue and differing mathematical backgrounds. By employing a range of differentiated activities—such as grouping learners by skill level, using manipulatives, and integrating games— teachers were able to provide targeted support that catered to individual learning styles. This strategy not only fostered a more inclusive classroom environment but also enhanced learner engagement and motivation, as learners could progress at their own pace. The teachers noted that these differentiated approaches, grounded in the principles of MTB-MLE, allowed them to effectively scaffold instruction, making complex numeracy concepts more accessible and relevant to all learners, thereby promoting their overall mathematical development.

Integration of Games and Interactive Methods

Teachers highlighted how incorporating games and interactive methods enhances learner engagement and learning outcomes. The incorporation of games and interactive activities was frequently mentioned as a strategy for engaging learners. Participant 5 noted the use of *"games, puzzles, concrete examples, and manipulatives,"* emphasizing how these interactive tools make learning more engaging and effective. By integrating games, learners are not only more interested in the lessons but also able to grasp mathematical concepts more thoroughly through hands-on experiences.

. Participants 9 and 8 discussed using "*games, puzzles, concrete examples/manipulation"* and "*differentiated activities and games*," respectively. These activities not only make learning enjoyable but also promote active participation and collaboration, which are vital for developing numeracy skills. They underscored the positive impact of interactive activities in showcasing a multifaceted approach to learning. This combination of interactive methods allows learners to learn through play and collaboration, which can enhance their understanding and retention of mathematical concepts. Participant 13 described using *"manipulatives, storytelling, and group work,"* which aligns with the theme of interactive learning. Teachers also noted the use of interactive methods, such as dramatization and games, as effective strategies for enhancing engagement and comprehension. Participant 14 stated, *"Use dramatization, games, and demonstration,"* reflecting a commitment to making learning enjoyable and effective. These methods make math instruction more dynamic and relatable, as learners engage with the material in a more interactive and participatory manner.

Recent reviews of game-based learning (GBL) have predominantly focused on digital games, even beyond the scope of mathematics education. GBL, as a teaching strategy in mathematics, seeks to balance traditional classroom instruction with interactive educational games, promoting learner-centered learning and increasing overall learning effectiveness (Lasut & Bawengan, 2020). In a systematic review of educational outcomes linked to GBL, Abdul Jabbar and Felicia (2015) identified 91 studies, with 18 specifically targeting mathematical content. While the review included both digital and non-digital games, only one study used a non-digital format—a "board and card-based game"—underscoring the dominance of digital platforms in GBL research.

The effectiveness of games and other interactive methods is further enhanced when integrated with mother tongue-based mathematics instruction. Using the learners' native language provides a foundation that makes interactive strategies, such as games, more relatable and accessible, thereby improving overall comprehension and engagement in mathematical concepts. The responses collectively demonstrate that integrating games and interactive methods into MTB-MLE can significantly enrich the learning experience. By incorporating playful and interactive elements, teachers can foster a more engaging and effective learning environment, where learners are more likely to participate actively and develop a deeper understanding of mathematical concepts.

The integration of games and interactive methods emerged as a key theme from the interview responses regarding the strategies employed by Sorsogon Pilot Elementary School (SPES) teachers in developing numeracy skills through Mother-Tongue-Based Multilingual Education (MTB-MLE). Teachers highlighted the effectiveness of using playful activities and hands-on learning experiences to engage learners in mathematical concepts, making the learning process enjoyable and impactful. By incorporating games, puzzles, and cooperative team activities, teachers reported that learners were more willing to participate and take risks in their learning. These interactive methods not only enhanced learners' understanding of numeracy skills but also allowed for collaborative learning, where peers could support each other in grasping complex ideas. Moreover, using familiar language and context in these activities fostered a comfortable environment, enabling learners to express themselves more freely and enhancing their overall confidence in mathematics. The responses underscored that integrating games and interactive methods within the MTB-MLE framework not only promotes numeracy development but also cultivates a love for learning among young learners.

The strategies employed by teachers in developing numeracy skills through Mother-Tongue Based Multilingual Education (MTB-MLE) focus on using manipulatives and concrete objects, differentiated instruction, and interactive methods. By incorporating physical materials like counters and puzzles, teachers make abstract mathematical concepts more tangible and relatable, enhancing learner engagement and understanding. Differentiated instruction tailors teaching methods to meet diverse learner needs, ensuring that each learner receives appropriate support and challenge, which fosters a more inclusive and effective learning environment. Additionally, integrating games and interactive activities makes learning more engaging and dynamic, promoting active participation and deeper comprehension of mathematical concepts. These strategies, when combined with instruction in the learners' native language, create a solid foundation for learning and help develop a positive relationship with mathematics from an early age.

Real-Life and Contextual Learning

Using the mother tongue in teaching mathematics emphasizes the importance of connecting mathematical concepts to learners' everyday experiences to enhance understanding and engagement. Many teachers emphasized the importance of relating mathematics to everyday experiences. Participant 10 emphasized the value of relating math instruction to learners' daily life experiences, stating, *"SMART way/based on their daily life experiences."* This approach allows learners to see the practical application of mathematical concepts in their own lives, making the learning process more relevant and meaningful.

Participant 13 noted, *"relating Math to everyday life and the use of manipulatives, storytelling, and group work."* This approach helps learners see the relevance of math in their lives and can enhance motivation and understanding. She highlighted the significance of contextual learning by integrating *"numeracy instructions through making a story in MTB."* By using storytelling, teachers can connect mathematical concepts to familiar scenarios, helping learners better understand and relate to the material. Participant 5

noted that using *"games, puzzles, concrete examples, and manipulatives"* is effective in making math instruction more contextually relevant. This strategy helps bridge the gap between abstract mathematical concepts and real-world applications, enhancing learners' ability to relate what they learn to practical situations.

Danoebroto and Suyata (2020) concluded that mathematics is a vital tool for solving everyday problems, closely intertwined with human and cultural dimensions. However, from an instrumentalist teacher's perspective, the concept of mathematical literacy rooted in local culture has yet to fully incorporate cultural elements as a framework for assessing and fostering mathematical literacy. This is partly because mathematics is often not viewed as a social construct shaped by local cultural practices and ideas. Therefore, teachers need to emphasize cultural integration by incorporating Mother Tongue-Based Multilingual Education (MTB-MLE) in mathematics instruction. The responses of teachers in this study highlight the importance of real-life and contextual learning strategies in MTB-MLE. By connecting mathematical concepts to learners' everyday experiences and using familiar cultural contexts, teachers can make math instruction more engaging and relevant, enhancing both understanding and retention of mathematical skills.

Real-life and contextual learning emerged as a key theme from the interview responses regarding the strategies employed by Sorsogon Pilot Elementary School (SPES) teachers in developing numeracy skills through Mother-Tongue-Based Multilingual Education (MTB-MLE). Teachers highlighted the effectiveness of using real-world scenarios and local examples to make numeracy lessons more relevant and relatable to their learners. By incorporating familiar contexts, such as community activities, cultural practices, and everyday experiences, teachers reported that learners were better able to grasp mathematical concepts and apply them in practical situations. This approach not only facilitated understanding but also fostered a sense of ownership and connection to the learning process, as learners could see the direct applicability of their studies in their daily lives. Furthermore, teachers noted that contextual learning strategies helped to engage learners more actively, encouraging participation and collaboration among peers, ultimately leading to improved numeracy skills and a deeper appreciation for their mother tongue.

Mastery of Language and Terminology

Teachers' responses highlight the significance of understanding and mastering both the language of instruction and the mathematical terminology used in the classroom. Participant 4 emphasized the importance of mastering both the language and mathematical terminology, noting, *"Difficult especially in our class emergent/FR learners, they can't count and identify numbers."* She emphasized the need for "mastery of the language and mathematical terminology." This highlights the critical role that language plays in understanding math concepts, particularly in an MTB-MLE context. Ensuring that learners have a strong grasp of both the Mother Tongue and relevant mathematical vocabulary is essential for successful numeracy development.

Participant 6 mentioned, *"Sometimes it is quite confusing on their parts regarding some terminologies."* This indicates that a strong grasp of language and terminology is crucial for effective instruction, particularly for learners who are still developing foundational skills. Participant 3 highlighted the role of explicit teaching and differentiated instructions in achieving mastery, stating, *"Explicit teaching and differentiated instructions."* This approach ensures that all learners, regardless of their language proficiency or background, can access and understand mathematical concepts effectively. Participant 5 mentioned the integration of *"concrete examples and manipulatives,"* which can aid in overcoming challenges related to language and terminology by providing tangible representations of abstract concepts.

This strategy supports learners in grasping difficult terms and concepts by linking them to physical objects they can interact with.

Participants highlighted the effectiveness of language-specific explanations. Participant 2 stated, "For example, adding numbers, I explain the process in Bicol first." This method not only aids comprehension but also builds learners' confidence in using their Mother Tongue. In their study, Karikari et al. (2020) found that teachers struggle to find precise vocabulary in the local language for mathematical terms written in English, making it challenging to translate these concepts effectively. Similarly, Lartec et al. (2014) identified the limited vocabulary in the mother tongue as a significant barrier to using L1 as the language of mathematics instruction. This lack of adequate terminology and phrases for explaining lessons in the mother tongue hampers the teaching process, creating difficulties in delivering clear and comprehensive instruction to learners. Consequently, this language gap poses a significant challenge to effective learning in multilingual classrooms.

Mastery of language and terminology emerged as a key theme from the interview responses regarding the strategies employed by Sorsogon Pilot Elementary School (SPES) teachers in developing numeracy skills through Mother-Tongue-Based Multilingual Education (MTB-MLE). Teachers highlighted the critical role that language proficiency plays in effectively teaching mathematical concepts, noting that a strong command of both the mother tongue and relevant mathematical terminology is essential for facilitating comprehension. Many teachers reported using explicit instruction to familiarize learners with key terms in their first language, which helped clarify mathematical ideas and reduce confusion. By ensuring that learners grasped the language and terminology associated with numeracy, teachers found that learners were better equipped to engage with problem-solving tasks and discussions. Furthermore, this mastery not only improved learners' confidence in using mathematical language but also enhanced their overall academic performance. The responses underscored that prioritizing language mastery within the MTB-MLE framework is vital for fostering a deeper understanding of numeracy skills and promoting effective communication in mathematics education.

The responses of the teachers in this study highlight that a strong command of language and terminology is crucial for the effective implementation of MTB-MLE in mathematics instruction. Providing clear translations and concrete examples of mathematical concepts enables learners to better understand and perform mathematical operations. Teachers who focus on clear and explicit language use, as well as practical examples and real objects, can significantly enhance learners' comprehension and application of mathematical concepts.

The emerging concepts emphasize the importance of connecting mathematical instruction to learners' everyday experiences and cultural contexts to enhance understanding and engagement. By using the mother tongue, teachers can make math more relatable and meaningful, helping learners see its practical applications in their daily lives. This approach also involves integrating storytelling, games, and manipulatives to bridge the gap between abstract concepts and real-world applications. Additionally, mastering both the language of instruction and mathematical terminology is crucial for effective teaching, as it ensures that all learners, regardless of their language proficiency, can access and understand the material. Clear translations and tangible examples help overcome language barriers, making mathematical concepts more accessible and comprehensible. These strategies collectively foster a more inclusive and effective learning environment, promoting deeper comprehension and retention of mathematical skills.

Use of Technology and Media

Teachers' responses reflect how digital tools and multimedia resources are integrated into teaching strate-

gies to enhance numeracy skills in the MTB-MLE framework. Teachers' responses reveal varied approaches and the effectiveness of incorporating technology and media into their instructional practices. Several participants noted the effectiveness of using visual aids to clarify concepts. Participant 8 stated, *"Explaining the lessons, using pictures,"* indicating that visual representations can bridge gaps in understanding.

Participant 2 noted the use of *"real objects, pictures, using the TV in the teaching-learning process,"* emphasizing that multimedia resources like television can provide visual and interactive elements that support learning. This approach helps make abstract mathematical concepts more tangible for learners. Participant 7 also mentioned the use of *"Smart television,"* highlighting how modern technology can be employed to present educational content in engaging and accessible ways. The use of smart technology enables teachers to integrate interactive elements into their lessons, which can capture learners' attention and facilitate better understanding. Participant 8 also noted the inclusion of *"pictures, real objects, and using technology,"* underscoring a multi-faceted approach that combines traditional and digital tools. This blend of resources supports diverse learning styles and enhances learners' ability to grasp mathematical concepts through various modalities.

A study by Zacal (2014) revealed that the use of multimedia can lead to significant improvements in teaching mathematics. Similarly, Watson et al. (2020) affirmed the effectiveness of educational television in enhancing mathematics instruction, particularly for young learners in remote rural settings. Similar to the present study, these findings highlight the potential of multimedia tools to support more engaging and effective learning experiences in mathematics. The responses of the key stage 1 teachers interviewed in this phenomenological research illustrate that the use of technology and media in MTB-MLE not only enriches the learning experience but also provides multiple avenues for learners to engage with and understand mathematical concepts.

The strategies employed by SPES teachers in developing numeracy skills using Mother-Tongue Based Multilingual Education (MTB-MLE) underscored the importance of contextualized and interactive teaching methods. Through the use of manipulatives, differentiated instruction, games, real-life applications, and multimedia tools, teachers can make mathematical concepts more accessible and engaging for young learners. These approaches align with the core principles of MTB-MLE, where instruction in the learners' native language enhances comprehension and retention. Though the SPES teachers face challenges, particularly with language mastery and terminology, the integration of varied teaching strategies reflects a comprehensive effort to bridge cultural and linguistic gaps in mathematics education, ensuring that learners gain a deeper understanding and practical application of numeracy skills. This multifaceted approach offers valuable insights for improving educational practices in multilingual settings.

The integration of digital tools and multimedia resources into teaching strategies enhances numeracy skills within the MTB-MLE framework by making abstract mathematical concepts more tangible and engaging. Utilizing technology such as smart televisions and multimedia resources provides visual and interactive elements that support learning, catering to diverse learning styles. This approach not only enriches the learning experience but also offers multiple avenues for learners to engage with and understand mathematical concepts. The use of manipulatives, differentiated instruction, games, real-life applications, and multimedia tools aligns with the core principles of MTB-MLE, promoting comprehension and retention through contextualized and interactive teaching methods. Despite challenges with language mastery and terminology, these varied strategies reflect a comprehensive effort to bridge cultural and

linguistic gaps in mathematics education, ensuring learners gain a deeper understanding and practical application of numeracy skills.

The use of technology and media emerged as a significant theme in the interview responses regarding the strategies employed by teachers at Sorsogon Pilot Elementary School (SPES) in developing numeracy skills through Mother-Tongue-Based Multilingual Education (MTB-MLE). Teachers highlighted how integrating digital tools, multimedia resources, and educational software into their lessons enhanced learner engagement and understanding of mathematical concepts. By utilizing technology, teachers were able to present numeracy problems in dynamic and interactive ways, catering to diverse learning styles and preferences. Moreover, media such as videos, games, and interactive applications provided contextualized learning experiences that connected numeracy skills to real-life scenarios, making the content more relatable and meaningful for learners. This innovative approach not only supported the effective delivery of numeracy instruction but also equipped learners with essential digital literacy skills, preparing them for a technology-driven world. The responses reflected a growing recognition among teachers of the transformative potential of technology and media in enriching the learning environment and enhancing the effectiveness of MTB-MLE strategies.

The study revealed that teachers employ various strategies to enhance numeracy skills through Mother-Tongue Based Multilingual Education (MTB-MLE). These strategies include using manipulatives and concrete objects to make abstract concepts more tangible, differentiated instruction to cater to diverse learning needs, and integrating games and interactive methods to boost engagement. Additionally, real-life and contextual learning connects mathematical concepts to learners' everyday experiences, making learning more relevant. Mastery of language and terminology is crucial for effective instruction, ensuring that learners can understand and apply mathematical concepts. The use of technology and media further enriches the learning experience by providing visual and interactive elements that support comprehension. These approaches collectively foster a more inclusive and effective learning environment, promoting deeper understanding and retention of mathematical skills.

3. Challenges Encountered by SPES Teachers in Developing Numeracy Skills through MTB-MLE

The 14 teachers interviewed for this study provided detailed accounts of the challenges they faced in developing numeracy skills among Key Stage 1 learners through mother tongue-based education. Participant 14 said, *"Using MTB in teaching Math is hard,"* indicating that some teachers find it challenging to consistently apply MTB-MLE, particularly when dealing with complex mathematical concepts. The teachers also discussed the strategies they employed to address these challenges. From their responses, five key themes emerged.

Terminology and Language

One of the most frequently cited challenges was the difficulty in translating mathematical terminologies into the local language. Despite the overall positive impact, some learners continue to struggle with MTB-MLE. Participants emphasized the significance of familiar language in their instruction. Participant 6 stated, "*By using familiar words in the lesson proper*," suggesting that using words learners already know can facilitate better understanding and engagement.

Several teachers identified issues with mathematical terminology in the Mother Tongue. Participant 1 highlighted *"the terminologies of number in MTB-MLE."* She shared, *"Children have difficulties in writing the names of each number in Mother Tongue."* Participant 4 expressed difficulty in *"translating English terminology to MTB language."* This indicates that the vocabulary necessary for teaching numeracy may not always exist in the Mother Tongue or may be unfamiliar to learners. Participant 6 pointed out the

challenge of translating shapes, saying, *"The translation of specific words like shapes."* These examples show how certain aspects of numeracy can become more complex when using MTB-MLE.

Many teachers expressed frustration over the lack of equivalent terms in MTB languages. Participant 5 mentioned, "Some children had difficulty in understanding terms in English, so too with the use of MTB." These examples suggest that MTB-MLE's benefits may not be evenly distributed across all learners. Participant 11 remarked, *"The terminologies of numbers in MTB-MLE are not familiar,"* indicating a gap in the available vocabulary for teaching math concepts.

Similarly, Participant 4 noted, *"In translating English terminology to MTB language, it becomes difficult, especially for technical math terms."* This difficulty often led teachers to avoid translating certain terms. Participant 3 explained, *"I don't like teaching reading numbers in Bicol... mathematical terminologies must remain as is."* To address these issues, some teachers opted to maintain the original English terms or use Filipino translations to simplify the lessons, as stated by Participant 1: *"I had to translate it into Filipino and English language."* This may suggest a need for more resources or training to help teachers navigate the difficulties of translating math into local languages.

Unpacking the demands of each word problem presents significant linguistic challenges for learners, particularly when studying mathematics in a language that is not their native tongue (Tshuma, 2020). Chibamba (2018) further underscored that translation is inherently problematic, as no translated text can perfectly capture the nuances of the original. Consequently, teachers need to use the mother tongue as the medium of instruction to effectively translate mathematical concepts. The difficulties highlighted by the teachers suggest that the MTB-MLE approach may not fully address the intricacies of mathematical instruction, especially concerning specialized vocabulary. Teachers' tendency to retain English terms or resort to Filipino translations reflects a practical compromise aimed at maintaining instructional clarity. This scenario underscores the urgent need to develop and standardize mathematical terminologies in MTB languages to enhance both teaching and learning efficacy.

Terminology and language emerged as a prominent theme in the interview responses regarding the challenges encountered by Sorsogon Pilot Elementary School (SPES) teachers in developing numeracy skills through Mother-Tongue-Based Multilingual Education (MTB-MLE). Teachers expressed difficulty in translating mathematical terms and concepts into the local dialect, noting that certain terminologies did not have direct equivalents in their mother tongue. This language barrier often led to confusion among learners, particularly when attempting to grasp complex mathematical ideas. Teachers highlighted that while they aimed to use familiar language to enhance comprehension, the challenge of navigating multiple languages—including English and Filipino—complicated their instruction. Additionally, some learners who were more proficient in a second language struggled with understanding numeracy concepts when presented in their mother tongue, which hindered their overall learning experience. The responses underscored the need for effective strategies to bridge these linguistic gaps, emphasizing that a clear understanding of terminology is crucial for fostering numeracy skills within the MTB-MLE framework.

Understanding and Materials

Several teachers reported that some mathematical concepts, such as division and multiplication, posed significant challenges. Participant 10 specifically mentioned difficulties with these concepts, while others commented on learners' general struggles with understanding language and materials, as noted by Participant 6: *"Sometimes learners cannot understand the word being used."* Participants also reported that the complexity of learning materials and learner comprehension posed significant challenges. Teachers expressed frustration with learning materials that are difficult to understand. Participant 7

mentioned that *"learning materials are difficult to understand,"* which can hinder effective instruction and learner comprehension.

Participant 7 noted, *"Learning materials are difficult to understand,"* while Participant 6 highlighted that *"Sometimes learners cannot understand the word being used."* The difficulty in understanding both the language and the content of the lessons made teaching more challenging. To address these difficulties, teachers employed various strategies. Participant 2 emphasized the importance of providing a review before proceeding to the next lesson. She shared, "*I always give a review first before proceeding to the next lesson."* This approach allows learners to consolidate their understanding and prepares them for new material. Participant 7 mentioned, *"I use multiple strategies that cater to the needs of my learners."*

Additionally, teachers utilized online resources to supplement the limited materials, as noted by Participant 12: *"As a teacher, I'm trying my best to use the internet so that I can provide the learning materials that will aid the needs of the learners."* This reflects a proactive approach to overcoming resource limitations by seeking diverse educational tools. Participant 3 also mentioned focusing on teaching numeracy skills where learners feel comfortable and exploring strategies online. This adaptability can help learners engage with content in a way that resonates with their learning preferences.

Hasibuan et al. (2019) concluded that learners' mathematical problem-solving abilities and learning independence significantly improved when using learning tools based on realistic mathematics education approaches. This finding underscores the importance of ensuring that learning tools meet criteria for validity, practicality, and effectiveness. Similarly, Kurniasih et al. (2020) found that learning tools incorporating mathematical games and manipulatives were validated as effective and practical. These studies highlight the critical role of developing high-quality, engaging, and pedagogically sound learning materials to enhance mathematical education. The difficulty in understanding materials observed by teachers among the key stage 1 learners suggests that current resources may not be well-adapted to the MTB-MLE framework. Teachers' strategies, such as providing reviews and using multiple teaching methods, indicate an adaptive approach to mitigate these issues.

Understanding and materials surfaced as significant challenges faced by SPES teachers in developing numeracy skills through Mother-Tongue-Based Multilingual Education (MTB-MLE). Teachers expressed difficulties in sourcing or creating instructional materials that are not only linguistically appropriate but also culturally relevant to their learners' diverse backgrounds. Many reported that existing resources often lacked the contextualization needed to effectively convey mathematical concepts, leading to confusion among learners. Additionally, the challenge of translating complex mathematical terminology into the mother tongue was highlighted, as it sometimes resulted in misinterpretations and hindered learners' understanding. This gap in effective materials and comprehension not only affected the learning process but also placed additional pressure on teachers to develop innovative strategies and resources. Consequently, the lack of suitable materials and the need for a clearer understanding of numeracy instruction emerged as barriers that teachers must navigate to optimize the benefits of MTB-MLE in their classrooms.

The challenges faced by SPES teachers in developing numeracy skills through MTB-MLE primarily revolve around language and terminology issues, as well as the complexity of learning materials and learner comprehension. Translating mathematical terms into local languages often proves difficult due to a lack of equivalent vocabulary, leading teachers to either retain English terms or use Filipino translations to maintain clarity. This highlights the need for standardized mathematical terminologies in MTB languages. Additionally, the complexity of learning materials and the difficulty learners face in

understanding both the language and content of lessons pose significant challenges. Teachers employ various adaptive strategies, such as providing reviews and using multiple teaching methods, to address these issues. The importance of high-quality, engaging, and pedagogically sound learning materials is emphasized to enhance mathematical education within the MTB-MLE framework.

Parental Involvement and Follow-Up

A recurring issue among the participants was the lack of parental involvement in their children's learning process. Participant 2 noted the challenge of following up on learners' learning skills through their parents. She identified this challenge, stating, *"To follow up the learning skills of the learners by their parents is a challenge."* This suggests that effective numeracy development is not only reliant on teaching strategies but also the involvement and support of families in reinforcing learning at home.

The lack of support from parents made it difficult to reinforce numeracy skills at home. Several participants mentioned that MTB-MLE helps bridge the gap between the language used at home and classroom learning. Participant 13 said, *"It allows learners to connect math concepts with their daily lives because they are learning in the language they use at home.*" This demonstrates that learners can more easily relate to and understand math when it's taught in their native language.

The teachers highlighted the importance of seeking support from parents and stakeholders. Participant 13 emphasized asking for support and further explained, *"Limited parental and community support makes it hard to monitor the children's progress."* To mitigate this, some teachers actively engaged with parents and the community. She mentioned, *"I ask for support from parents and other stakeholders."*

Participant 14 noted the importance of assistance from parents in translating MTB into English. He added, *"I ask assistance from parents, and by translating the MTB into the English language."* These responses underscore the importance of parental and community involvement in the successful implementation of MTB-MLE. Engaging parents can enhance the learning environment at home and reinforce classroom instruction.

The study by Huang et al. (2021) found that different aspects of parental involvement influence mathematics achievement in various ways. Moreover, the effect of parental involvement on math performance is frequently mediated by learners' mental health and math self-efficacy. These findings suggest that effective interventions should focus on enhancing parental involvement in ways that support learners' mental well-being and boost their confidence in math. In the present study, the lack of parental involvement and support highlights a critical area for intervention. Teachers' efforts to engage parents and the community suggest that involving these stakeholders is crucial for reinforcing learning outside the classroom. Effective strategies may include workshops for parents and community-based programs to enhance support for MTB-MLE initiatives.

The challenges in developing numeracy skills through MTB-MLE are compounded by a lack of parental involvement, which hinders the reinforcement of learning at home. This lack of support makes it difficult to monitor and enhance children's progress. Teachers have attempted to engage parents and the community to mitigate this issue, highlighting the importance of their involvement in the successful implementation of MTB-MLE. Studies indicate that parental involvement significantly influences mathematics achievement, often mediated by learners' mental health and self-efficacy. Effective interventions should therefore focus on enhancing parental involvement to support learners' well-being and confidence in math. This underscores the need for workshops and community-based programs to bolster support for MTB-MLE initiatives.

Parental involvement and follow-up emerged as a significant theme in the interview responses regarding the challenges encountered by SPES teachers in developing numeracy skills through Mother-Tongue-Based Multilingual Education (MTB-MLE). Teachers expressed concerns about the limited engagement of parents in their children's education, which hindered the reinforcement of numeracy concepts learned in school. Many teachers noted that without active parental support and communication, learners struggled to practice and apply their numeracy skills at home.

Additionally, the lack of follow-up from parents on homework and classroom activities contributed to a disconnect between school learning and home reinforcement. This gap not only affected learners' confidence and proficiency in numeracy but also highlighted the need for stronger collaboration between teachers and families. The responses emphasized that fostering parental involvement and establishing effective follow-up strategies are essential to overcoming these challenges and enhancing the overall effectiveness of numeracy instruction in the MTB-MLE framework.

Resource Constraints

The scarcity of instructional resources was a major concern for many teachers. Participant 12 identified *"inadequacy of instructional materials"* as a significant challenge, while Participant 13 highlighted *"limited educational resources"* as a constraint. Teachers had to be resourceful, often relying on online platforms to supplement their teaching. Participant 12 mentioned using the *"comparison constant method wherein improvisation of instructional materials is written."* This suggests a flexible approach to teaching, where teachers adapt materials and methods based on the specific needs of their learners, further enhancing learning experiences. She shared, *"I'm trying to use the internet to find learning materials that will help the learners."* Participant 13 explained, *"I ask for support from parents and other stakeholders."* These responses reflect the teachers' dedication but also highlight the urgent need for more comprehensive support and resources to effectively implement MTB-MLE.

Resource constraints in the teaching of numeracy using MTB-MLE present significant challenges for both teachers and learners. A lack of adequate instructional materials, such as localized textbooks, manipulatives, and learning aids in the mother tongue, hampers the effective delivery of lessons. Teachers often face difficulties in finding or creating resources that align with both the numeracy curriculum and the linguistic needs of their learners, especially in multilingual or rural settings. Additionally, limited access to technology, such as multimedia tools and digital platforms that could facilitate the contextualization of lessons, further restricts the teaching process. These constraints force teachers to rely on improvised materials, which may not fully meet the needs of diverse learners, ultimately affecting the quality of numeracy instruction and learners' comprehension of key mathematical concepts.

In his study, Karalı (2022) highlighted a lack of materials and insufficient lesson hours as significant challenges impacting mathematics teaching. Nearly all teachers in his study reported that material shortages hindered their ability to effectively teach mathematics. This scarcity of resources points to a broader systemic issue that requires institutional intervention. In the current study, teachers' reliance on online resources and their efforts to seek support from stakeholders demonstrate their resourcefulness, yet also underscore the urgent need for better-equipped classrooms and more accessible instructional materials. Investing in the development and distribution of educational resources is crucial for enhancing the effectiveness of MTB-MLE practices.

Resource constraints emerged as a significant theme from the interview responses regarding the challenges encountered by SPES teachers in developing numeracy skills through Mother-Tongue-Based Multilingual Education (MTB-MLE). Many teachers reported a lack of adequate instructional materials, such as

manipulatives and visual aids, which hindered their ability to effectively implement MTB-MLE strategies. Additionally, limited access to technology and teaching resources further complicated the integration of contextualized learning experiences into their numeracy instruction.

These constraints not only affected the quality of education but also posed difficulties in engaging learners meaningfully in the learning process. Teachers expressed a desire for more support from the administration and the community to secure the necessary resources that would enable them to create a more enriching educational environment. The responses highlighted the urgent need for improved resource allocation to empower teachers in delivering effective numeracy education that leverages the strengths of MTB-MLE.

Learner Background and Transfer Learners

The diverse linguistic backgrounds of learners, particularly transfer learners, presented additional challenges. Participants 5, 6, 8, and 9, advocated for using the learners' L1 in giving instructions. This practice ensures that learners receive guidance in a language they understand best, making it easier for them to grasp complex concepts.

Some participants mentioned that certain learners were more proficient in a third language (L3) or English, making it harder for them to grasp concepts taught in their Mother Tongue. For example, Participant 5 observed, *"some learners were more efficient in using L3 languages,"* while Participant 8 noted, *"learners or learners, English as their L1 are hard to understand the lesson."* This indicates that learners' varying language backgrounds can complicate instruction.

Participant 9 also observed, *"Some learners were more efficient and could understand well in Language 3, especially learners that come from private schools."* Participant 8 added, *"Learners whose first language is English find it hard to understand the lesson in MTB-MLE."* To accommodate these learners, teachers adapted their instructional language. Participant 5 noted, *"I use the L1 of the learners in giving instruction,"* which allowed for better communication and understanding in multilingual classrooms.

Participant 12 identified a *"multilingual environment"* as a challenge, indicating that the presence of multiple languages can complicate instruction and communication. Similarly, Participant 13 pointed to the *"transition to second language,"* which can further complicate the learning process. Participant 14 mentioned that some transfer learners find it difficult to understand MTB-MLE, suggesting that these learners may not have had prior exposure to instruction in their Mother Tongue, making the transition challenging. For transfer learners, teachers might need to provide extra support or differentiated instruction to help them adjust to the MTB-MLE framework, ensuring they can engage with the curriculum effectively.

Casalan (2020) noted that transfer learners with different first languages often face challenges in understanding lessons and participating in class. He explained that language confusion in schools can lead to diminished interest in learning. These learners frequently struggle with lessons conducted in unfamiliar languages, which can lead to disengagement from classroom activities. When language barriers prevent learners from fully participating, their educational experience can become frustrating and less rewarding, potentially affecting their overall academic performance and motivation to attend school.

The experiences of teachers in this study reveal that the diverse linguistic backgrounds of learners, including those with different primary languages or who are transfer learners, pose challenges for implementing MTB-MLE. Teachers' strategies, such as using learners' native languages for instruction, demonstrate their efforts to address these challenges. This underscores the need for adaptable teaching approaches that accommodate various linguistic backgrounds and ensure that all learners can effectively engage with and benefit from MTB-MLE.

The challenges faced by SPES teachers in developing numeracy skills through MTB-MLE reveal significant gaps in the current implementation of the program. The lack of mathematical terminologies in local languages, difficulties with learning materials, limited parental involvement, resource constraints, and the linguistic diversity of learners are all obstacles that hinder the effectiveness of this instructional approach. Despite these challenges, teachers demonstrated resilience by adapting their strategies to accommodate the needs of their learners. However, these findings highlight the urgent need for systemic support, such as developing standardized mathematical terminologies in MTB languages, improving access to resources, and fostering greater parental and community involvement. Addressing these concerns will be critical in enhancing the efficacy of MTB-MLE and ensuring that all learners, regardless of their linguistic background, can thrive in mathematics education.

The scarcity of instructional resources significantly impacts teachers' ability to implement MTB-MLE effectively, forcing them to rely on online platforms and seek external support. This issue underscores the urgent need for better-equipped classrooms and more accessible instructional materials. Additionally, the diverse linguistic backgrounds of learners, particularly transfer learners, present challenges in understanding lessons, leading to disengagement and frustration. Teachers' strategies to use learners' native languages for instruction highlight their efforts to address these challenges. The overall findings reveal significant gaps in the current implementation of MTB-MLE, emphasizing the need for systemic support, such as developing standardized mathematical terminologies in local languages, improving access to resources, and fostering greater parental and community involvement. Addressing these concerns is crucial for enhancing the effectiveness of MTB-MLE and ensuring all learners can thrive in their education.

Learner background and transfer learners emerged as significant themes from the interview responses regarding the challenges encountered by SPES teachers in developing numeracy skills through Mother-Tongue-Based Multilingual Education (MTB-MLE). Teachers noted that learners' varying linguistic and cultural backgrounds often posed difficulties in delivering effective numeracy instruction. Transfer learners, in particular, presented unique challenges, as they might be accustomed to different educational approaches and language mediums that were not aligned with MTB-MLE practices. This disparity created gaps in understanding and engagement, making it harder for teachers to implement consistent and effective teaching strategies. Teachers expressed concerns about the need to assess and accommodate the diverse backgrounds of their learners, as this would require additional effort to ensure that all learners, including those from different language backgrounds or educational systems, could grasp essential mathematical concepts. The responses highlighted the importance of recognizing and addressing these challenges to create an inclusive learning environment that supports the numeracy development of all learners.

The study reveals that SPES teachers face significant challenges in developing numeracy skills through MTB-MLE, primarily due to language and terminology issues, complex learning materials, limited parental involvement, resource constraints, and the diverse linguistic backgrounds of learners. Translating mathematical terms into local languages often proves difficult, leading teachers to retain English terms or use Filipino translations to maintain clarity. The complexity of learning materials and learners' difficulty in understanding both the language and content further complicate teaching. The lack of parental involvement hinders the reinforcement of learning at home, while resource constraints force teachers to rely on online platforms and seek external support. Additionally, the diverse linguistic backgrounds of learners, particularly transfer learners, present challenges in understanding lessons, leading to disengagement and frustration.

Despite these obstacles, teachers demonstrate resilience by adapting their strategies to accommodate learners' needs. However, the findings highlight the urgent need for systemic support, such as developing standardized mathematical terminologies in local languages, improving access to resources, and fostering greater parental and community involvement. Addressing these concerns is crucial for enhancing the effectiveness of MTB-MLE and ensuring all learners can thrive in their education.

4. How SPES Teachers Contextualize, Translate and Localize Numeracy Instruction within MTB-MLE

Key Stage 1 teachers at Sorsogon Pilot Elementary School (SPES) exhibit common practices in contextualizing and localizing their mathematics instruction to enhance learner understanding. The teachers provided valuable insights and shared their experiences on how they make math lessons both comprehensible and relevant to their learners. Through the responses of the 14 teachers, five distinct themes emerged, highlighting the various strategies employed to adapt numeracy instruction within the MTB-MLE framework.

Language Simplification

The theme of language simplification was a prominent strategy among teachers for making numeracy instruction accessible within the MTB-MLE framework. Teachers mentioned the need to simplify their teaching methods. Participant 2 recommended, *"Use the simplest and easiest way of teaching MTB-MLE subject."* This approach helps ensure that concepts are accessible and less overwhelming for learners. Participant 10 suggested making concepts simpler, which is a critical strategy for enhancing comprehension, particularly when dealing with challenging mathematical ideas.

To tackle issues with terminology, some teachers reported translating terms into Filipino or English, as noted by Participant 1: *"I had to translate it in Filipino and English language."* This strategy helps bridge the gap for learners who may struggle with the Mother Tongue. Participants highlighted the necessity of translating concepts into local languages when learners struggle to understand foreign terms. Participant 3 mentioned that if concepts are not clear in a foreign language, they translate them into Filipino and Bicol through demonstrations or real-object examples. This method not only aids comprehension but also connects abstract mathematical ideas to tangible experiences.

Simplifying language helps demystify complex mathematical concepts and facilitates clearer understanding. For instance, Participant 2 emphasized, *"Use the simplest and easiest way of teaching MTB-MLE subject,"* indicating a clear focus on breaking down complex ideas into more manageable and understandable terms. Similarly, Participant 1 noted, *"Use the common language to facilitate the learning,"* highlighting the importance of using straightforward language to support comprehension. By prioritizing simplicity, teachers aim to ensure that all learners can grasp mathematical concepts without being hindered by complicated terminology.

Pado (2013) asserted that beginning learners rely on the language they have grown up with when engaging in cognitive processes. Therefore, Key Stage 1 teachers must simplify their instructions to ensure that learners not only comprehend the material but can also respond effectively. Teachers emphasized the importance of using simplified language to facilitate understanding. By breaking down complex mathematical concepts into more accessible language, teachers make these ideas easier for learners to grasp. Many teachers noted that employing straightforward language and familiar terms plays a key role in bridging gaps in comprehension and supporting learning outcomes.

Language simplification emerged as a prominent theme from the interview responses regarding how SPES teachers contextualize, translate, and localize numeracy instruction within the framework of Mother-

Tongue-Based Multilingual Education (MTB-MLE). Teachers emphasized the necessity of using simplified language to make mathematical concepts more accessible to learners. By breaking down complex terms and using straightforward vocabulary, teachers were able to enhance learners' comprehension of numeracy skills. Furthermore, teachers reported translating key mathematical terminologies into the local language, ensuring that learners could relate to the content and grasp its significance. This approach not only facilitated better understanding but also fostered a more engaging learning environment where learners felt confident in expressing their thoughts and asking questions. The emphasis on language simplifications underscores the critical role of clear communication in effective teaching, as it helps bridge language gaps and enables learners to build a solid foundation in numeracy through a medium that resonates with their everyday experiences.

Real-Life Contextualization

Real-life contextualization emerged as a crucial strategy for making mathematics instruction relevant and engaging. Teachers adapted lessons to include real-world scenarios and familiar contexts, bridging the gap between abstract concepts and learners' everyday experiences. They highlighted the importance of tailoring instruction to the specific dialects used by learners. Participant 7 remarked, *"Based on the first language/dialect used by the learner,"* illustrating how leveraging local dialects enhances relatability and comprehension. She added, *"I base my lesson on real-life scenarios,"* showcasing a commitment to making lessons relatable.

Participant 8 further explained, *"By giving examples, exercises, and using multimedia,"* demonstrating a practical approach to embedding real-life contexts into lessons. These strategies help learners see the direct application of mathematical concepts, making learning more engaging and relevant. Participant 10 said, *"Yes, counters, illustrations, and situational,"* emphasizing the value of using relatable examples to help learners connect with the material. This approach fosters a deeper understanding of mathematical concepts by situating them in real-world contexts.

Contextualizing lessons with real-life examples emerged as a vital strategy for making mathematics relevant and understandable. Contextualized teaching involves connecting lessons to the real-life and cultural contexts of learners (Spring, 2010). Perin (2011) stated that this approach links classroom instruction to concrete applications that resonate with learners' interests. Teachers in the present study reported using everyday scenarios and familiar contexts to help learners relate mathematical concepts to their daily lives. Utilizing local resources found in the community helps make lessons more engaging and appropriate to the learners' level of understanding. Additionally, starting lessons with familiar situations from the community can capture the learners' attention and enhance their engagement with schoolwork.

Real-life contextualization emerged as a prominent theme from the interview responses regarding how SPES teachers contextualize, translate, and localize numeracy instruction within the framework of Mother-Tongue-Based Multilingual Education (MTB-MLE). Teachers emphasized the importance of relating mathematical concepts to learners' everyday experiences to enhance understanding and engagement. By incorporating familiar situations and practical examples into their lessons, teachers were able to bridge the gap between abstract mathematical ideas and the learners' lived realities. This approach not only made learning more relevant but also facilitated easier comprehension, as learners could connect new knowledge to their daily lives. Furthermore, teachers shared that utilizing local language and culturally appropriate contexts in instruction helped demystify complex numeracy concepts, ensuring that learners felt more comfortable and confident in their mathematical abilities. Overall, real-life contextualization was seen as

a vital strategy in making numeracy instruction more effective and meaningful within the MTB-MLE framework.

Teachers at Sorsogon Pilot Elementary School employ strategies to make mathematics instruction more accessible and relevant within the MTB-MLE framework. Simplifying language is a key approach, helping to break down complex mathematical concepts into more understandable terms, ensuring that all learners can grasp the material. Additionally, real-life contextualization is used to make lessons more engaging by connecting mathematical concepts to learners' everyday experiences. This involves incorporating real-world scenarios and familiar contexts into lessons, which helps learners see the practical applications of what they are learning. These strategies highlight the importance of making instruction both comprehensible and relevant to enhance learner understanding and engagement.

Multisensory Approaches

Teachers reported using multisensory approaches to enhance understanding and cater to various learning styles. By incorporating visual aids and hands-on materials, teachers aim to make abstract concepts more tangible. Many teachers affirmed the effectiveness of manipulatives like counters and real objects. Participant 1 stated, *"Using counters,"* while Participant 9 added, *"counters, number cards, real objects, pictures."* These tools provide tactile experiences that help learners visualize and understand mathematical concepts more clearly. Participant 8 mentioned, *"By using pictures,"* while Participant 11 added, *"Utilizing using educational course materials."* These approaches allow learners to interact with mathematical concepts through multiple sensory channels, which can be particularly beneficial for those who struggle with language or abstract reasoning. Participant 13 also noted, *"I use local language (Sorsogon) to ensure that learners fully understand the mathematical concept,"* underscoring the importance of using familiar terms and materials to reinforce learning.

Teachers employed multisensory approaches to cater to diverse learning styles and reinforce mathematical concepts through multiple sensory experiences. This approach is particularly helpful for learners who struggle with language or abstract concepts. Forrest and Herring-Watson (2023) emphasized the importance of incorporating hands-on, multisensory learning experiences in math instruction to enhance both learner engagement and depth of understanding. By involving multiple senses, this approach allows learners to interact with mathematical concepts in a more tangible way, which is especially valuable for younger learners. As math content becomes more abstract in middle school, offering concrete representations of mathematical processes helps solidify understanding and promotes deeper connections to the material, fostering experiential learning that is essential for long-term retention.

Multisensory approaches emerged as a prominent theme from the interview responses regarding how SPES teachers contextualize, translate, and localize numeracy instruction within Mother-Tongue-Based Multilingual Education (MTB-MLE). Teachers emphasized the importance of engaging multiple senses to enhance learners' understanding of mathematical concepts. By incorporating visual aids, hands-on manipulatives, and auditory elements, teachers were able to create dynamic learning experiences that catered to diverse learning styles. For instance, using real-life objects, pictures, and interactive activities not only helped learners grasp abstract concepts more easily but also made lessons more relatable and enjoyable. This multisensory approach allowed teachers to effectively bridge language gaps, as learners could connect numerical ideas with tangible experiences in their mother tongue. The responses underscored that such strategies not only facilitate comprehension but also foster a more inclusive and participatory classroom environment, where learners feel empowered to engage actively in their numeracy development.

Teachers at SPES employ strategies to make mathematics instruction more accessible and relevant within the MTB-MLE framework. Simplifying language is a key approach, helping to break down complex mathematical concepts into more understandable terms, ensuring that all learners can grasp the material. Additionally, real-life contextualization is used to make lessons more engaging by connecting mathematical concepts to learners' everyday experiences. This involves incorporating real-world scenarios and familiar contexts into lessons, which helps learners see the practical applications of what they are learning. Multisensory approaches are also utilized to cater to diverse learning styles, incorporating visual aids and hands-on materials to make abstract concepts more tangible. These strategies highlight the importance of making instruction both comprehensible and relevant to enhance learner understanding and engagement.

Cultural Relevance

Cultural relevance was a key theme in making numeracy instruction effective and meaningful. Teachers adapted lessons to align with learners' cultural backgrounds, using local languages and culturally familiar contexts. Participant 5 highlighted, *"We use MTB in giving instructions to facilitate learning,"* indicating a preference for using local languages to aid understanding. Participant 13 also emphasized, *"I use local language to ensure that learners fully understand mathematical concepts,"* illustrating the importance of cultural alignment in instruction. These practices help learners connect mathematical concepts with their cultural experiences, enhancing engagement and making the content more relatable.

Cultural relevance was identified as crucial for effective numeracy instruction. Teachers emphasized the importance of using local languages and culturally familiar contexts to make lessons more relatable and engaging for learners. Samaupan (2019) highlighted how traditional cultural practices, such as games and livelihood activities, inherently demonstrate mathematical concepts. For example, in traditional games like flipping the *binungan* (coconut shell) or choosing the *taya* ("It"), concepts such as permutation, combination, and probability are at play. Similarly, livelihood activities like *sinamay* weaving, *banig* (mat) making, and crop production involve mathematical ideas like arrangement, parallel rows, and design choices. These practices prove that mathematics is deeply intertwined with cultural practices, offering unique opportunities for culturally relevant instruction. Culturally relevant instruction thus enriches the educational experience, making mathematics both meaningful and accessible to learners in their local context.

Cultural relevance is crucial in the teaching of numeracy for primary graders using MTB-MLE because it bridges the gap between abstract mathematical concepts and the learners' everyday experiences. By integrating culturally familiar examples, language, and contexts into lessons, teachers can make numeracy more relatable and easier to grasp for young learners. When children see mathematical problems framed in terms of their local environment, such as using familiar objects, local practices, or community-based scenarios, they are more likely to engage with the material and understand its practical application. Cultural relevance not only enhances comprehension but also fosters a deeper connection between the learners and the subject, empowering them to use mathematics in real-life situations. This approach is especially important in MTB-MLE, as the use of the mother tongue in combination with culturally relevant content helps maintain learners' interest and confidence, promoting a more inclusive and effective learning experience.

Cultural relevance plays a crucial role in making numeracy instruction effective and meaningful by aligning lessons with learners' cultural backgrounds. Using local languages and culturally familiar contexts helps learners connect mathematical concepts with their own experiences, enhancing engagement

and relatability. Traditional cultural practices, such as games and livelihood activities, inherently demonstrate mathematical ideas like permutation, combination, probability, arrangement, and design choices. This approach not only makes mathematics more accessible but also enriches the educational experience by showing how deeply intertwined mathematics is with everyday cultural practices.

Cultural relevance emerged as a central theme from the interview responses concerning how SPES teachers contextualize, translate, and localize numeracy instruction within the framework of Mother-Tongue-Based Multilingual Education (MTB-MLE). Teachers emphasized the importance of integrating local cultural elements and familiar contexts into their lessons to enhance learner engagement and comprehension. By using culturally relevant examples, such as traditional games, local scenarios, and community practices, teachers were able to make abstract mathematical concepts more tangible and relatable for their learners. This approach not only facilitated understanding but also fostered a sense of pride and connection to their cultural heritage. Teachers reported that when numeracy instruction incorporated familiar cultural references, learners were more motivated to participate and demonstrated improved learning outcomes. The responses highlighted that culturally relevant teaching practices are essential for creating an inclusive classroom environment that recognizes and values the diverse backgrounds of learners, ultimately enriching the educational experience within the MTB-MLE framework.

Practical Application

Practical application of mathematical concepts was frequently cited as an effective teaching strategy. Teachers adapted lessons to include practical exercises and real-life examples, helping learners see the relevance of what they are learning. Participant 10 stated, *"By adding/subtracting the things they have,"* demonstrating how practical activities can reinforce mathematical skills. Participant 11 noted, *"By translating the math terminologies into the L1 they already know,"* showing a focus on making concepts more understandable through familiar language. These strategies not only help learners apply mathematical concepts to everyday problems but also reinforce the utility of mathematics in real life.

Participants mentioned the use of demonstrations and situational contexts to facilitate understanding. Participant 12 remarked, *"Demonstration and giving situation for easy to understand,"* which illustrates how practical examples can clarify abstract concepts. Practical application of mathematical concepts was frequently cited as an effective strategy. Teachers adapted lessons to include practical exercises and examples that learners can relate to and apply in real-life situations. Thus, experiential teaching activities allow learners to learn, be creative, and apply their knowledge in real-world contexts (Ministry of Education and Training, 2018). Pambudi's (2022) research further supported this by demonstrating that outdoor learning methods significantly enhance elementary learners' motivation and achievement in geometry, emphasizing the value of practical, hands-on experiences in education.

The strategies employed by SPES teachers to contextualize, translate, and localize numeracy instruction within the MTB-MLE framework reveal a deliberate and thoughtful approach to enhancing learner comprehension. By simplifying language, incorporating real-life contextualization, using multisensory approaches, ensuring cultural relevance, and focusing on practical application, teachers effectively adapt their instruction to meet the needs of their learners. These methods not only help bridge the gap between complex mathematical concepts and learners' understanding but also foster deeper engagement by making learning more relatable and meaningful. The experiences of these teachers underscore the importance of a flexible, learner-centered approach in successfully implementing MTB-MLE in mathematics instruction.

The practical application of mathematical concepts is highlighted as an effective teaching strategy, with teachers incorporating practical exercises and real-life examples to make lessons more relevant and engaging. This approach helps learners understand and apply mathematical concepts in everyday situations, reinforcing the utility of mathematics. Research supports that experiential teaching activities, such as outdoor learning, significantly enhance learners' motivation and achievement. The strategies used by teachers to contextualize, translate, and localize numeracy instruction within the MTB-MLE framework demonstrate a thoughtful approach to enhancing learner comprehension. By simplifying language, incorporating real-life contexts, using multisensory approaches, ensuring cultural relevance, and focusing on practical application, teachers bridge the gap between complex mathematical concepts and learners' understanding, fostering deeper engagement and making learning more relatable and meaningful. Practical application emerged as a central theme from the interview responses regarding how SPES teachers contextualize, translate, and localize numeracy instruction within the framework of Mother-Tongue-Based Multilingual Education (MTB-MLE). Teachers emphasized the importance of connecting mathematical concepts to real-life situations and experiences that resonate with their learners. By using familiar contexts and relatable examples, teachers were able to make abstract numeracy concepts more accessible and meaningful for their learners. For instance, teachers incorporated local scenarios, cultural references, and hands-on activities that allowed learners to see the relevance of mathematics in their daily lives. This approach not only enhanced comprehension but also fostered learner engagement and motivation, as learners could readily apply their mathematical knowledge to practical situations. The responses highlighted that practical application is crucial in bridging the gap between theoretical knowledge and everyday experiences, ultimately leading to a deeper understanding and appreciation of numeracy skills among learners.

5. The MTB-MLE Teachers in Formulating Learner Assessment to Enhance Numeracy Skills

The teachers provided valuable insights into the role of assessment in mathematics instruction, particularly within the context of mother tongue-based education. Their responses revealed five key themes regarding the significance of assessment and the methods used to evaluate learners' progress in numeracy.

Monitoring Progress and Achievement

Many teachers emphasized the role of assessment in tracking learner progress and determining whether learning objectives are met. Participant 3 noted that assessment is crucial *"to measure the achievement of the objectives and learners' progress."* Participant 3 articulated that assessment is essential for measuring the achievement of learning objectives and tracking learners' progress. This process allows teachers to determine if their instructional methods are effective and if learners are meeting expected learning outcomes. Similarly, Participant 7 said, *"To know whether they have learned something,"* indicating that assessment serves as a checkpoint to verify the learning process. This suggests that teachers view assessments not merely as a formality but as a means of understanding how much knowledge and skill learners have retained over time.

Participant 11 reinforced the idea that assessment is critical for determining learners' capabilities and abilities. This knowledge helps teachers understand where their learners excel and where they need more support. Related to this, Participant 12 suggested that mathematics assessment plays a key role in establishing learning goals. It helps define clear expectations and outcomes, allowing both teachers and learners to focus on achieving specific objectives. Participant 14 highlighted the role of assessment in identifying the need for interventions. By evaluating learners' performance, teachers can determine which

learners require additional support and resources to succeed.

Ngunjiri (2022) highlighted the critical role of assessment in providing learners with feedback on their learning progress. Knowing their current understanding helps learners gauge their achievements, which can motivate further learning. In the present study, teachers view assessment as essential for tracking learners' learning journey. It provides them with a way to gauge whether learners are grasping the material and making progress toward learning goals. This finding reveals the importance of ongoing assessments in ensuring learners are meeting educational benchmarks and advancing in their numeracy skills.

Assessment plays a crucial role in mathematics instruction within mother tongue-based education, serving as a tool to monitor learner progress and ensure learning objectives are met. It provides valuable feedback to learners, helping them understand their current level of knowledge and motivating further learning. Teachers view assessment as essential for tracking learners' learning journeys, ensuring they grasp the material and make progress toward educational goals. This ongoing evaluation is vital for meeting educational benchmarks and advancing learners' numeracy skills, highlighting the importance of continuous and meaningful assessment in the learning process.

Monitoring progress and achievement emerged as a vital theme from the interview responses regarding the role of assessment in SPES teachers' efforts to enhance numeracy skills. Teachers highlighted the importance of ongoing assessment to gauge learners' understanding and mastery of mathematical concepts within the Mother-Tongue-Based Multilingual Education (MTB-MLE) framework. Through various assessment tools, such as formative tests, quizzes, and practical activities, teachers were able to identify individual learners' strengths and areas for improvement. This continuous monitoring enabled teachers to tailor their instructional strategies effectively, ensuring that all learners received the necessary support to progress in their numeracy skills. Additionally, the feedback gathered from assessments informed teachers about the effectiveness of their teaching methods, allowing them to adjust their approaches as needed to better meet the diverse needs of their learners. The responses underscored that a robust system of monitoring progress and achievement is essential for fostering a supportive learning environment where learners can thrive in their mathematical development.

Addressing Learning Gaps

A recurring theme was the importance of assessment in identifying struggling learners, allowing teachers to offer targeted interventions. Participant 2 highlighted that assessments help *"to address the slow learners,"* while Participant 14 noted that assessments help *"to find out if they are learning to give intervention."* She underscored the importance of measuring learners' abilities quantitatively. By translating skills and understanding into numbers, teachers can gain a clearer picture of where each learner stands in terms of numeracy skills. These responses underline the teachers' belief that assessments are tools for differentiation, enabling them to focus on learners who may need extra help, ensuring no learner is left behind.

Assessments play a critical role in identifying learners who are struggling, allowing teachers to intervene with appropriate support. The teachers' responses emphasize the teachers' belief that assessments are crucial tools for differentiation, allowing them to identify learners who require extra support. By using assessments in this way, teachers ensure that no learner is left behind, adapting their instruction to meet individual needs and providing necessary interventions to those who may be struggling.

Dabell (2021) highlighted that research demonstrates the significant impact of high-quality formative assessment on learning outcomes. Formative assessment becomes effective when teachers collaborate with learners to help them recognize their existing knowledge, gaps, and partial understandings. This

process enables learners to gauge their level of complexity while actively engaged in their studies. By diagnosing learners' proficiency levels, formative assessments provide teachers with crucial insights to identify and address gaps in learning, ultimately guiding instructional strategies to better support learner development.

Assessment plays a vital role in addressing learning gaps in the teaching of numeracy for primary graders using MTB-MLE, as it provides teachers with critical insights into each pupil's understanding and progress. By regularly evaluating learners through formative and summative assessments, teachers can identify areas where learners struggle, whether it be with specific mathematical concepts, language barriers, or comprehension issues related to the mother tongue. These assessments enable teachers to tailor their instruction to meet the individual needs of their learners, adjusting strategies, materials, and pace to ensure that no learner is left behind.

Moreover, assessment helps in tracking the effectiveness of teaching approaches and the relevance of MTB-MLE in fostering numeracy skills, allowing for timely interventions, such as targeted support for slow learners or the introduction of differentiated instruction. Ultimately, the use of assessment in MTB-MLE supports a more inclusive and equitable learning environment, ensuring that every child has the opportunity to build a solid foundation in numeracy.

Addressing learning gaps emerged as a significant theme from the interview responses regarding the role of assessment in SPES teachers' efforts to enhance numeracy skills. Teachers underscored the critical function of assessment in identifying individual learners' strengths and weaknesses, allowing them to tailor their instructional approaches accordingly. By utilizing various assessment tools, such as formative tests, quizzes, and practical work, teachers were able to pinpoint specific areas where learners struggled and implement targeted interventions to bridge these gaps. This process enabled teachers to develop a more nuanced understanding of each learner's progress, ultimately fostering a more inclusive learning environment that caters to diverse needs. Furthermore, assessments provided valuable insights into the effectiveness of teaching strategies, guiding teachers in refining their practices to ensure that all learners, regardless of their starting point, had the opportunity to achieve proficiency in numeracy. Overall, the responses highlighted that addressing learning gaps through effective assessment is essential for promoting equitable educational outcomes in the context of numeracy development.

Adapting Instructional Strategies

Assessment results inform teachers about the effectiveness of their teaching methods, guiding them in adjusting strategies to better suit learner needs. Participant 5 stated, *"To know the level and capabilities of each pupil so that the teacher can use the appropriate strategy."* Participant 9 echoed this by saying assessments help teachers *"do the appropriate strategies and activities suited to the ability, capabilities of the learners."* This reflects the adaptive nature of teaching within the MTB-MLE framework, where teachers tailor their instruction based on the learner's demonstrated skills and understanding.

Participant 2 emphasized that assessment is crucial to identifying and addressing the needs of slow learners. In addition, participants 5 and 9 highlighted the necessity of knowing the levels and capabilities of each pupil. This understanding allows teachers to select appropriate strategies and activities tailored to individual learning needs, thereby enhancing the effectiveness of their instruction. This approach ensures that teachers can tailor their instruction and support to help these learners catch up and improve their numeracy skills.

Assessment for learning is viewed as a highly responsive and personalized approach to teaching, where teachers adapt and make informed decisions based on the immediate needs of learners during a lesson.

Barton (2018) emphasized that "successful formative assessment can help identify problems and address them in real-time much more effectively and efficiently." This perspective underscores the value of formative assessments in providing timely feedback that guides instructional adjustments, ultimately enhancing the learning experience.

According to the teachers interviewed in this study, assessment results guide them in adjusting their teaching methods to meet the needs of different learners. This indicates that assessments are not just summative tools but formative ones, helping teachers tailor their lessons to match the abilities of their learners. The responses suggest that teachers value assessments as part of an adaptive teaching process, where instruction evolves based on the feedback provided by learner performance.

Assessment is crucial in identifying learners who struggle, allowing teachers to provide targeted interventions and ensure no learner is left behind. It plays a significant role in differentiating instruction and helping teachers adapt their methods to meet individual needs. High-quality formative assessments are particularly effective, as they enable teachers to collaborate with learners, recognize existing knowledge, and address learning gaps. This process not only guides instructional strategies but also enhances the overall learning experience by providing timely feedback. Teachers view assessments as essential tools for both monitoring progress and adapting their teaching to better support learner development.

Adapting instructional strategies emerged as a prominent theme from the interview responses regarding the role of assessment in SPES teachers' efforts to enhance numeracy skills. Teachers highlighted the necessity of flexible and responsive teaching methods that align with learners' diverse learning needs and assessment outcomes. Through ongoing evaluation, teachers were able to identify individual strengths and areas for improvement, allowing them to tailor their instructional approaches accordingly. For instance, when assessments revealed specific challenges in understanding certain mathematical concepts, teachers modified their lesson plans to incorporate varied instructional techniques, such as hands-on activities, visual aids, or peer collaboration. This adaptability not only facilitated more effective learning experiences but also encouraged a growth mindset among learners, as they recognized their progress and areas for development. The responses underscored that a continuous cycle of assessment and adaptation is essential for fostering a supportive and effective learning environment, ultimately leading to improved numeracy skills among learners.

Evaluating Teaching Effectiveness

Participant 4 mentioned using pre-and post-assessments to gauge learning outcomes before and after instruction. This method helps measure the effectiveness of teaching strategies and provides insights into learner growth. Participants 6, 7, and 8 pointed out that assessment helps determine whether learners are learning effectively. By evaluating learning outcomes, teachers can assess the effectiveness of their instructional strategies and make necessary adjustments. They highlighted the use of formative assessments, problem-solving tasks, and quizzes to continuously monitor learning outcomes. Formative assessments allow teachers to gather feedback and make real-time adjustments to their instruction.

Participant 10 also emphasized that assessment reveals the effectiveness of the strategies used in lessons. This feedback is essential for continuous improvement in teaching practices. Teachers use assessment results as feedback on their instructional practices. Participant 6 explained that assessments are essential *"to assess whether the strategies used are effective,"* while Participant 10 remarked that assessments *"tell the effectiveness of the strategies used in the lesson."* This theme shows that teachers not only assess

learners but also engage in reflective practice, using assessment outcomes to improve their teaching techniques and approaches.

Ngunjiri (2022) emphasized that assessments fulfill various critical roles, one of which is guiding future educational decisions. They offer teachers a valuable opportunity to reflect on the effectiveness of their instruction and tailor support accordingly. According to the teachers interviewed in this study, assessments are instrumental in evaluating the success of instructional strategies. By analyzing assessment outcomes, teachers can identify effective methods and areas needing improvement, allowing them to adjust their teaching techniques to better support learner understanding and engagement.

Assessment plays a vital role in evaluating teaching effectiveness in the teaching of numeracy for primary graders using MTB-MLE. It provides teachers with critical insights into how well learners understand mathematical concepts when taught in their mother tongue, allowing for real-time adjustments in teaching strategies. Through assessments, teachers can determine whether the use of MTB-MLE is effectively bridging language barriers and enhancing numeracy skills, or if learners are struggling with certain terminologies or concepts. Regular assessment helps identify learning gaps, enabling teachers to offer targeted interventions, differentiate instruction, and implement strategies tailored to the needs of individual learners.

Moreover, it allows teachers to evaluate the appropriateness of the instructional methods and materials used within the MTB-MLE framework, ensuring that cultural and linguistic contexts are being effectively integrated into numeracy lessons. Ultimately, assessment provides a measurable way to ensure that teaching practices are driving meaningful learner progress, fostering both academic success and language development.

Evaluating teaching effectiveness emerged as a vital theme from the interview responses concerning the role of assessment in SPES teachers' efforts to enhance numeracy skills. Teachers recognize that assessment serves not only as a tool for measuring learning outcomes but also as a critical component for evaluating their instructional practices. Through various assessment methods, including formative tests and practical applications, teachers were able to gauge learner progress, identify learning gaps, and adjust their teaching strategies accordingly. This reflective process allowed them to determine which approaches were most effective in facilitating numeracy skill development and to make informed decisions about future lessons. Moreover, teachers noted that assessment provided valuable feedback on the effectiveness of their methods, enabling them to refine their practices and better support their learners' diverse learning needs. The insights gained from assessments not only informed instructional adjustments but also fostered a culture of continuous improvement among teachers, ultimately enhancing the overall quality of numeracy instruction within the MTB-MLE framework.

Utilizing a Variety of Assessment Tools

Teachers employ multiple methods of assessment to gauge numeracy skills effectively within the MTB-MLE framework. Participants 1 and 2 mentioned using pencil and paper tests as a primary assessment method. This traditional approach provides a straightforward way to evaluate learners' knowledge and understanding of numeracy concepts. Participant 3 emphasized the use of various assessment types and integration, indicating a holistic approach to assessing numeracy skills. This diversity can accommodate different learning styles and provide a more comprehensive view of learner progress.

Participant 9 mentioned incorporating oral assessments, group outputs, and individual performance evaluations, which can foster collaboration and engagement among learners while allowing teachers to assess understanding in various contexts. She pointed out, *"Some were orally done, paper-pencil tests,*

group outputs, and individual performance," indicating a diverse approach to assessment. Other teachers, such as Participant 4, mentioned using *"pre and post-assessments,"* while Participant 6 referred to *"formative tests and problem-solving"* tasks.

Participants 7 and 8 noted the use of standardized tests as a method for assessing numeracy skills. These tests provide a benchmark for comparing learner performance against established standards. Participant 14 described a practical work approach to assessment, emphasizing hands-on activities and individual assessments that can lead to a deeper understanding and application of numeracy skills. The variety of methods, including standardized tests, oral evaluations, practical assessments, and group activities, reflects an effort to accommodate different learning styles and ensure a comprehensive evaluation of learners' abilities.

Ukobizaba et al. (2021) argued that mathematics teachers should be encouraged to assess learners' mathematical knowledge and skills in a manner that reflects their true understanding. Teachers need to deliver instruction in a clear and comprehensible medium, ensuring that assessment activities align with learners' abilities. This approach not only supports effective teaching but also ensures that assessments accurately measure learners' grasp of mathematical concepts. In the present study, teachers use a mix of assessment methods to comprehensively evaluate their learners' numeracy skills. This diversity of tools allows teachers to assess learners in multiple ways, catering to different learning styles and providing a more rounded picture of learners' abilities. This approach ensures that assessments are inclusive and that all learners have opportunities to demonstrate their skills, whether through hands-on activities, written work, or verbal responses.

The role of assessment in enhancing numeracy skills among SPES teachers is multifaceted, serving as a critical tool for monitoring progress, addressing learning gaps, adapting instructional strategies, evaluating teaching effectiveness, and utilizing diverse assessment methods. The teachers' insights reveal that assessments go beyond mere evaluation; they are instrumental in shaping instruction, identifying learner needs, and providing targeted interventions to support struggling learners. By using a variety of assessment tools, teachers ensure a comprehensive understanding of learners' abilities, making learning more accessible and tailored to individual needs within the MTB-MLE framework. Ultimately, these assessments empower both learners and teachers, fostering a more effective and responsive learning environment.

Assessment is pivotal in evaluating teaching effectiveness and providing feedback that helps teachers refine their instructional practices. It serves as a reflective tool, allowing teachers to analyze the success of their strategies and make necessary adjustments to enhance learner understanding and engagement. Additionally, teachers employ a variety of assessment methods to cater to different learning styles and ensure a comprehensive evaluation of learners' abilities. This diverse approach includes oral evaluations, written tests, practical assessments, and group activities, ensuring that all learners have opportunities to demonstrate their skills. By integrating these assessments, teachers can monitor progress, address learning gaps, and adapt their instructional strategies to meet individual needs, ultimately fostering a more effective and responsive learning environment.

Utilizing a variety of assessment tools emerged as a key theme from the interview responses concerning the role of assessment in SPES teachers' efforts to enhance numeracy skills. Teachers recognized that employing diverse assessment methods is essential for accurately gauging learners' understanding and progress in mathematics. They utilized a combination of formative and summative assessments, including pencil-and-paper tests, oral evaluations, and practical activities, to capture a comprehensive picture of

each learner's capabilities. This multifaceted approach allowed teachers to tailor their instructional strategies to meet the individual needs of learners, enabling them to identify specific areas where learners excelled or struggled. Additionally, the incorporation of real-world tasks and collaborative projects in assessments provided opportunities for learners to demonstrate their understanding in practical contexts. The responses underscored that a varied assessment toolkit not only enhances teaching effectiveness but also empowers learners to engage more deeply with numeracy concepts, fostering a supportive and responsive learning environment.

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CHAPTER V
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents a summary of the previous discussions, outlining the findings, conclusions, and recommendations based on the specific research problems. Key aspects of the study are reviewed to provide a concise background on the purpose of this phenomenological research, detailing the steps and processes undertaken by the researcher to gather and process the data. The researcher transcribed and analyzed the interview data, interpreting the participants' experiences to uncover the realities surrounding the impact of Mother Tongue-Based Multilingual Education (MTB-MLE) on the numeracy skills development of Key Stage 1 learners at Sorsogon Pilot Elementary School (SPES).

Key concepts

Mathematics is deeply intertwined with everyday human activities and is a universal element across all cultures (Ekwueme, 2013). Esuong and Ibok (2022) highlighted that mathematics facilitates clear, precise, and effective communication between individuals, regardless of their cultural background. Charanchi (2013) contended that for primary education in mathematics, as with any subject, instruction must be delivered in a language that learners understand to make the fundamental concepts, principles, and laws meaningful. Language is crucial for the effective transmission of knowledge, and choosing an instructional medium is a key factor in the success of the teaching and learning process.

The use of the mother tongue in teaching mathematics at the elementary level, especially in Key Stage 1, significantly influences learners' learning experiences. When lessons are conducted in their native language, learners can better grasp mathematical concepts and instructions, leading to improved understanding and retention. This approach supports the development of numeracy skills by making mathematical language and operations more accessible and relatable. As a result, learners can connect new knowledge with their everyday experiences more effectively, enhancing their overall engagement and performance in mathematics.

Research Questions

This phenomenological study examined the experiences of primary grade mathematics teachers at Sorsogon Pilot Elementary School (SPES) concerning the implementation of Mother Tongue-Based

Multilingual Education (MTB-MLE) in numeracy instruction for primary learners. Through an exploration of the teachers' lived experiences, the study aimed to address the following research questions:

1. How do SPES teachers perceive the impact of Mother Tongue-Based Multilingual Education (MTB-MLE) on numeracy skill development among key stage 1 learners?
2. What strategies do SPES teachers employ to develop numeracy skills using MTB-MLE?
3. What challenges do SPES teachers encounter in developing numeracy skills through MTB-MLE?
4. How do SPES teachers contextualize, translate, and localize numeracy instruction within MTB-MLE?
5. What role do MTB-MLE teachers play in formulating learner assessments to enhance numeracy skills?
6. What enhanced school-based MTB-MLE for Key Stage 1 learners can be proposed to improve their numeracy skills?

Research Process

This study employed a phenomenological approach to explore the impact of Mother Tongue-Based Multilingual Education (MTB-MLE) on the development of numeracy skills among key stage 1 learners at Sorsogon Pilot Elementary School (SPES). Phenomenology was used to examine individuals' conscious experiences from their first-person perspective, aiming to understand how teachers' experiences with MTB-MLE influenced their teaching practices and, consequently, affected learners' numeracy development.

Purposive sampling was used to select participants. Out of the 30 teachers initially targeted, 14 participated. Nine teachers declined to participate, while seven did not attend the scheduled group interviews or focus group discussions despite confirming their availability.

To validate the research instrument, pilot interviews were conducted with key stage 2 teachers at SPES. Nine teachers—three from each of Grades 4, 5, and 6—participated in a group interview. Feedback from these pilot interviews validated the interview guide and helped refine follow-up questions, ensuring that the final instrument effectively captured relevant information.

A semi-structured interview guide was employed to gather insights into the participants' experiences. This approach created a relaxed and conversational environment, encouraging teachers to share their experiences openly. Data collection included both individual and focus group interviews with 5 teachers from Grade 1, 5 from Grade 2, and 4 from Grade 3, providing a mix of in-depth perspectives and collective discussions.

Ethical considerations were strictly observed. All participants completed the informed consent process, which outlined the study's purpose, participant expectations, and the researcher's contact information. The consent form also emphasized participants' rights to withdraw from the study at any time and to request the removal of their data, ensuring anonymity and confidentiality throughout the research.

The recorded interviews were transcribed to accurately represent participants' responses. The analysis involved transcribing and bracketing the data to provide a comprehensive understanding of teachers' experiences with MTB-MLE. Responses were categorized into meaningful units to identify emergent themes related to the implementation of MTB-MLE in mathematics instruction. By maintaining a reflective stance throughout the analysis, the researcher ensured a rigorous interpretation of the data, resulting in a detailed and comprehensive understanding of how MTB-MLE impacted mathematics teaching.

Findings

The researcher presents the following findings based on a detailed analysis of the data collected from the teachers:

1. Teachers observed that MTB-MLE generally improves learners' understanding and engagement in numeracy, though challenges with translating mathematical terminology occasionally create confusion.
2. Teachers employ a variety of strategies to develop numeracy skills using MTB-MLE, including differentiated instruction, concrete examples, manipulatives, and real-life applications.
3. Teachers face several challenges in developing numeracy skills through MTB-MLE, including difficulties with the translation of mathematical terminologies, lack of familiarity with number words in local languages, and variations in learners' language proficiency.
4. Teachers utilize a variety of strategies to contextualize, translate, and localize numeracy instruction within the MTB-MLE framework, including the use of local languages, real-life examples, and visual aids.
5. Teachers underscore the importance of assessment in enhancing numeracy skills by using a variety of methods to gauge learner progress, and effectiveness of instructional strategies, and to address individual learning needs.
6. The challenges faced by teachers highlight the necessity for an enhanced MTB-MLE program designed to enhance numeracy skills among Key Stage 1 learners.

Conclusions

Based on the established findings, the following conclusions can be drawn:

1. While MTB-MLE positively impacts numeracy skills by utilizing learners' native languages, the effectiveness is sometimes diminished by difficulties in translating mathematical terms and concepts.
2. The diverse range of strategies and teaching aids employed demonstrates the flexibility and adaptability of MTB-MLE in numeracy instruction, though effectiveness varies depending on the specific materials and methods used.
3. The challenges experienced by teachers highlight the complexities involved in using MTB-MLE for numeracy instruction, particularly in ensuring accurate translation and addressing diverse language proficiencies among learners.
4. Effective contextualization and localization of numeracy instruction through MTB-MLE involve a combination of translating terms, employing familiar examples, and using the local language to enhance understanding and relevance for learners.
5. Assessment is crucial for understanding learner progress, tailoring instruction, and identifying areas for intervention, which helps in effectively developing numeracy skills.
6. Based on the findings of the study, an enhanced MTB-MLE program for developing numeracy skills of key stage 1 learners can be developed.

Recommendations

Considering the above conclusions, the researcher offers the following recommendations:

1. Teachers be provided with training focused on deepening their understanding and appreciation of the impact of MTB-MLE on the development of numeracy skills.
2. Targeted professional development be provided to enhance teachers' competency in delivering math instruction through MTB-MLE.
3. A support system within the school be established to assist teachers in overcoming challenges related to developing numeracy skills in Key Stage 1 learners.

4. Workshops be conducted to assist teachers in effectively translating and contextualizing mathematical terminology in MTB, thereby enhancing overall instructional clarity and effectiveness.
5. Technical assistance be provided to teachers for them to effectively utilize diverse assessment strategies and tools.
6. The Proposed Enhanced MTB-MLE Program for Developing Key Stage 1 Numeracy Skills be considered for implementation.

Suggestions for Future Researchers

The researcher recommends the following areas of focus for future research:

1. Comparative Study of MTB-MLE and Traditional Instruction Methods
2. Learners Perceptions of MTB-MLE in Mathematics
3. Parental and Community Involvement in MTB-MLE
4. Cultural Relevance in MTB-MLE Mathematics Instruction
5. Technological Integration in MTB-MLE for Mathematics

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