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The Interaction Between Literacy and Numeracy Development Under Mother-Tongue Instruction in Foundation Phase Schools

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Abstract. Mother-tongue instruction is widely recognized as a key factor in supporting early learning. However, limited attention has been given to how literacy and numeracy skills interact when learners are taught through their home language. This study investigates the relationship between literacy development and numeracy performance among Foundation Phase learners in mother-tongue instruction classrooms. Using a qualitative method, data were collected through classroom observations and semi-structured interviews with teachers. Data was collected from several Foundation Phase schools to ensure contextual diversity. Fifteen (15) teachers teaching Grades R to 3 were purposively selected across these schools to ensure variation in teaching experience, grade level, and school context. The findings reveal a strong interconnectedness between literacy proficiency and numeracy competence: learners with higher reading fluency, oral language skills, and vocabulary knowledge demonstrate improved understanding of mathematical concepts and better performance in word-based numeracy tasks. Teachers also report that mother-tongue instruction enhances conceptual clarity, facilitates accurate interpretation of mathematical language, and supports learners' ability to reason, explain, and solve problems. However, challenges such as limited mother-tongue resources, inconsistent instructional strategies, and the linguistic complexity of mathematics hinder the full integration of literacy and numeracy. Based on these findings, the study recommends sustained implementation of mother-tongue instruction in the Foundation Phase, targeted professional development for teachers on integrating literacy and numeracy instruction, and the development of contextually relevant teaching and

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learning materials in indigenous languages. The study concludes that strengthening mother-tongue literacy is essential to supporting early numeracy development and recommends more integrated pedagogical approaches, improved teacher training, and increased provision of mother-tongue learning materials.

Keywords: Mother-Tongue Instruction; Foundation Phase; Literacy Development; Numeracy Outcomes; Language-Mathematics Interaction

1. Introduction

Mother-tongue competence remains central to effective teaching and learning in the Foundation Phase, where language serves as the basis for developing literacy and numeracy skills. The language of learning and teaching (LoLT) significantly influences how learners interpret concepts, engage with learning materials, and participate in classroom activities. Research shows that when teachers use learners' home languages, young children process information more fluently and coherently, which supports foundational literacy and numeracy development (Mashige, Cekiso & Meyiwa, 2019). Teachers act as linguistic and cognitive mediators in multilingual and rural South African classrooms and using the mother tongue enhances conceptual clarity and learner participation (McKinney & Guzula, 2024). However, despite policy provisions supporting mother-tongue instruction, implementation remains fraught with challenges, including limited teacher training, scarce resources, and negative community attitudes (Khanyile & Awung, 2023).

In South Africa's linguistically diverse education system, mother-tongue instruction bridges home and school experiences, thereby strengthening both literacy and numeracy learning (Sibanda & Tshehla, 2025; Diko & Celliers, 2024). Studies show that learners taught in familiar languages engage more confidently with academic tasks and demonstrate stronger comprehension and higher-order thinking. This is especially important in numeracy, where language mediates mathematical vocabulary, reasoning, and problem-solving processes (Malindi, Ndebele & Gobingca, 2023). Yet the effective use of the mother tongue in mathematics and literacy remains inconsistent across many Foundation Phase classrooms as teachers navigate systemic barriers and societal attitudes that continue to privilege English over indigenous languages (Sibanda & Tshehla, 2025).

While mother-tongue instruction has been widely studied, a noticeable research gap remains regarding how literacy and numeracy interact during early learning when taught through the home language. Most studies tend to address literacy and mathematics separately. However, emerging work suggests that mother-tongue teaching enables learners to build stronger conceptual connections across learning domains (Shuukwanyama et al., 2022). Despite evidence showing that children learn best when both literacy and numeracy are mediated in their home language, there is limited empirical research exploring how these two skill areas develop simultaneously within the Foundation Phase and in multilingual South African contexts.

This study focuses on Foundation Phase schools in linguistically diverse, predominantly rural settings, where learners navigate complex language environments that shape their academic development. The study aims to deepen our understanding of how mother-tongue instruction supports the development of literacy and numeracy, how these two domains interact, and what challenges or enabling factors shape effective LoLT implementation.

Despite widespread literature on the language of learning and instruction and the instruction in early-grade education, a major knowledge gap remains regarding how literacy and numeracy can develop under mother-tongue instruction, particularly in diverse, largely rural Foundations Phase contexts. The literature usually treats literacy and numeracy as separate fields and focuses more on literacy outcomes, while the mutual correlation between the two in early education is under-researched.

In addition, much of the research has been conducted in urban or semi-urban contexts; therefore, there is little empirical evidence on rural schools, where complex language ecologies, limited resources, and contextual realities influence the processes of teaching and learning (Shuukwanyama et al., 2022). The originality of the study is that it provides an integrated analysis of literacy and numeracy as mutually dependent areas of mother-tongue instruction, it examines schools with linguistic diversity at the rural Foundation phase, and it explores the lived experiences of teachers across Grades R-3, providing contextually informed and original insights about policy, pedagogy, and professional development.

To achieve these aims, the study addresses the following research questions:

1. How does mother-tongue instruction influence literacy development in the Foundation Phase?
2. How does mother-tongue instruction support numeracy learning and mathematical understanding?
3. In what ways do literacy and numeracy skills interact during early learning when the mother tongue is used as the LoLT?
4. What contextual factors enable or hinder effective mother-tongue instruction in Foundation Phase schools?

Addressing these questions will provide valuable insights into the role of mother-tongue instruction in shaping foundational academic development and inform policy and pedagogical practices that strengthen early learning. Ultimately, this study highlights the importance of robust mother-tongue-based pedagogies, enhanced teacher training, and supportive school environments that foster equitable literacy and numeracy outcomes for all young learners.

1.1 Conceptualizing mother-tongue instruction, literacy, and numeracy

Mother-tongue instruction refers to the use of learners' home language as the primary medium for teaching and learning, enabling them to engage with content more confidently and meaningfully. When instruction is delivered in a familiar language, learners demonstrate stronger comprehension and improved

participation because the mother tongue supports clearer cognitive processing (Shuukwanyama et al., 2022). In the Foundation Phase, mother-tongue instruction enhances literacy development by strengthening phonological awareness, vocabulary, reading fluency, and comprehension, all of which form the basis for early academic success (Mashige, Cekiso & Meyiwa, 2019). Similarly, numeracy development is enhanced when mathematical concepts, such as number recognition, problem-solving, and reasoning, are taught in a language that learners understand well, thereby reducing linguistic barriers to mathematical thinking (Malindi, Ndebele, & Gobingca, 2023).

In early childhood education, mother-tongue instruction serves as a bridge between home and school, facilitating the transfer of linguistic, cognitive, and cultural knowledge from familiar contexts into formal learning. It supports interactive learning, encourages exploratory dialogue, and promotes learner engagement, key processes through which foundational literacy and numeracy skills are constructed (Sibanda & Tshehla, 2025). Teacher proficiency in the home language and the availability of pedagogical resources strongly influence the effectiveness of mother-tongue instruction, shaping how teachers scaffold learning and managing classroom discourse (Shuukwanyama et al., 2022). Positive attitudes toward home-language use further enhance its success, creating inclusive spaces where learners' linguistic identities are valued (Sibanda & Tshehla, 2025).

In this study, mother-tongue instruction is conceptualized as the systematic and pedagogically guided use of learners' first language to build literacy and numeracy skills in the Foundation Phase. This conceptualization acknowledges the linguistic, cognitive, and socio-cultural dimensions of learning, highlighting how the home language facilitates deeper comprehension, problem-solving, and meaningful engagement. In implementing mother-tongue teaching, educators provide learners with holistic, culturally responsive learning experiences that strengthen foundational academic outcomes in multilingual educational contexts.

2. Literature Review and Theoretical Framework

2.1. Theoretical Foundations of Mother-Tongue Instruction in Early Childhood Education

Mother-tongue instruction is anchored in key theoretical perspectives that position language as central to children's cognitive development. Cummins' Linguistic Interdependence Theory argues that proficiency in the first language provides a foundation for the acquisition of additional languages and academic skills, suggesting that literacy and numeracy learned in the home language facilitate later transfer to other languages of instruction (Saeed, 2021). Similarly, Vygotsky's socio-cultural theory emphasises the role of language as a mediating tool in cognitive development, implying that children reason more effectively when instruction is delivered in a familiar linguistic code (Nishanthi, 2020).

Empirical evidence supports these theories, showing that early learning in the home language enhances conceptual understanding, learner confidence, and

engagement across subject areas, including mathematics (Englis & Boholano, 2021).

Studies conducted across African and Asian contexts reinforce the theoretical claim that home-language instruction strengthens foundational cognitive processes crucial for academic learning. Trujillo (2020) demonstrates that learners taught in their mother tongue over several years show progressive improvement in comprehension and problem-solving, which are core components of both literacy and numeracy development. Similarly, Englis and Boholano (2021) note that when mathematical concepts are introduced through familiar linguistic structures, learners display improved reasoning and reduced cognitive load. These findings collectively affirm the theoretical assertion that the home language serves as an essential cognitive and cultural resource for learning in early childhood settings.

2.2. Literacy Development Processes Under Mother-Tongue Instruction

Research consistently demonstrates that literacy skills such as reading comprehension, vocabulary, phonological awareness, and early writing develop more effectively when children learn in their mother tongue. For example, Naddumba and Athiemoolam (2022) found that teachers who use learners' home language are better able to scaffold reading and writing activities, resulting in improved functional literacy outcomes. Similarly, Nishanthi (2020) argues that mother-tongue instruction promotes rich vocabulary development and deeper comprehension because children can relate new information to familiar linguistic structures. The use of culturally relevant texts in the home language further supports meaning-making and encourages learner participation (Leighton, 2022).

At the classroom level, teachers' experiences highlight the effectiveness of mother-tongue instruction in the early literacy stages. Koloti and Jita (2021) report that Grade R teachers in Lesotho observed stronger phonological awareness and pre-reading skills among learners taught through their home language. Alimi et al. (2020) further support this by showing that primary pupils who received instruction in the mother tongue outperformed their peers in literacy assessments. Together, these findings illustrate that mother-tongue instruction not only facilitates the acquisition of foundational literacy skills but also enhances engagement, comprehension, and learner confidence.

2.3. Numeracy Development and Mathematical Understanding in the Mother Tongue

A growing body of research highlights the positive relationship between mother-tongue instruction and numeracy development. Gaspar (2023) found that learners taught mathematics in their home language displayed significantly stronger number sense and problem-solving abilities compared to those taught in English, demonstrating the cognitive advantage of learning mathematical concepts in a familiar language. Alfonso-Mendoza (2021) similarly shows that mother-tongue-based multilingual education enhances conceptual understanding of numeracy tasks, as learners can articulate mathematical reasoning more effectively. These findings align with earlier evidence by Alimi et al. (2020), who reported that

pupils in Osun State exhibited improved numeracy scores when taught in their mother tongue.

Vocabulary plays a critical role in the development of mathematical understanding, and mother-tongue instruction supports learners' access to mathematics-specific terminology. Bezuidenhout (2022) found strong associations between early numeracy and familiarity with mathematical vocabulary, emphasising that children require language proficiency to engage in reasoning and conceptual learning. Furthermore, Esuong et al. (2024) note that using the home language to communicate mathematical ideas enhances learners' confidence and participation in numeracy lessons.

However, challenges remain, as Mohammed et al. (2025) highlight, including limited resources and teacher training that can undermine the effectiveness of mother-tongue instruction in mathematics. Nonetheless, research overwhelmingly supports the role of home-language instruction in strengthening numeracy development in early schooling.

2.4. The Interdependence Between Literacy and Numeracy Skills in Early Grade Learning

Literacy and numeracy development are interdependent processes, with language skills playing a central role in mathematical learning. Shvartsman and Shaul (2023) demonstrate that working memory contributes to both early literacy and numeracy development, suggesting that these domains rely on shared cognitive systems. Chang (2023) similarly found that early literacy skills, including vocabulary and reading comprehension, predict later mathematics achievement, particularly in tasks requiring interpretation of word problems. These findings highlight how language proficiency supports numeracy learning by providing learners with the tools to understand mathematical instructions and express reasoning.

Cross-sectional and longitudinal studies further show that home literacy and numeracy practices reinforce each other. Salminen et al. (2021) report that children exposed to rich literacy and numeracy environments at home show stronger developmental trajectories in both domains during early schooling. Bezuidenhout (2022) adds that mathematics-specific vocabulary is closely linked to early numeracy performance, again demonstrating the bridging role of language. Similarly, Soto-Calvo et al. (2020) found that home numeracy and literacy experiences jointly contribute to early number skills, reinforcing the interconnected nature of these foundational competencies. The evidence suggests that literacy and numeracy development are mutually reinforcing processes, especially in multilingual African contexts where language plays a central role in knowledge acquisition.

2.5. Challenges and Contextual Realities of Implementing Mother-Tongue Instruction in Foundation Phase Schools

Despite its pedagogical benefits, implementing mother-tongue instruction poses numerous challenges in African educational contexts. Salie and Moletsane (2021) found that historically disadvantaged schools often face barriers, including

inadequate learning materials, insufficient teacher training, and inconsistent policy implementation. These constraints hinder teachers' ability to deliver high-quality instruction in learners' home languages. Similarly, Khanyile and Awung (2023) highlight challenges in isiZulu-speaking schools, where teachers report overcrowded classrooms, multilingual student populations, and limited parental support, as parents often prefer English instruction.

At the policy and systemic level, mother-tongue instruction is further constrained by socio-cultural attitudes and structural inequalities. Makokha (2024) reports that in Kenya, resistance from parents and school communities stemming from perceptions that English offers better economic opportunities undermines the adoption of mother-tongue instruction in pre-primary schools. Makena and Nzabe (2025) add that inconsistent policy implementation and lack of political commitment hinder the long-term sustainability of home-language initiatives. These challenges reveal a gap between policy intentions and classroom realities, suggesting that successful implementation requires stronger institutional support, community engagement, and adequate resourcing.

2.6 Theoretical framework

This study is grounded in Vygotsky's sociocultural theory, which posits that learning is socially mediated and profoundly influenced by language. Vygotsky (1978) argues that language serves as a psychological tool, enabling learners to construct meaning through interaction with teachers and peers. In Foundation Phase contexts, mother-tongue instruction supports the mediation of both literacy and numeracy skills by allowing learners to engage in learning tasks using a language that aligns with their cognitive development (Cole & Scribner, 1997). This theory, therefore, provides a basis for understanding how linguistic familiarity enhances comprehension, problem-solving, and conceptual development.

The study also draws on Cummins' Linguistic Interdependence Hypothesis, which posits that strong literacy skills developed in the first language transfer positively to additional languages (Cummins, 1979). Cummins (2000) further explains that cognitive and academic language proficiency developed in the mother tongue supports learners' ability to interpret mathematical instructions, solve word problems, and understand literacy tasks across the curriculum. This framework helps explain why learners in mother-tongue instruction settings often demonstrate stronger conceptual understanding in both literacy and numeracy.

In addition, the study is informed by Bruner's Constructivist Theory, which emphasizes that children actively construct knowledge through guided discovery and meaningful engagement with learning materials. Bruner (1966) maintains that learners make sense of new concepts more effectively when instruction builds on what they already know. When Foundation Phase learners are taught in their home language, they are better able to articulate their thinking, ask questions, and participate in literacy and numeracy activities in ways that support conceptual growth (Wood, Bruner & Ross, 1976). This theoretical lens supports the importance of using familiar language as a scaffold for complex academic content.

This study is also guided by the language-as-resource perspective, which views learners' home languages as assets rather than barriers. Scholars such as Ruiz (1984) and Heugh (2015) argue that mother-tongue instruction enhances cognitive development, strengthens learner participation, and supports deeper comprehension in multilingual classrooms. This approach is particularly relevant in the Foundation Phase, where conceptual understanding in literacy and numeracy depends heavily on learners' ability to process and communicate using familiar linguistic structures. Collectively, these theoretical perspectives highlight the central role of language in cognitive development and academic learning. They provide a strong foundation for exploring how mother-tongue instruction supports the interaction between literacy and numeracy development in Foundation Phase schools.

3. Methodology

This study employed a qualitative research approach within the interpretivist paradigm, which assumes that knowledge is constructed through human experiences, interactions, and the meanings individuals attach to their social worlds. This approach was appropriate for exploring how Foundation Phase teachers perceive and experience the interaction between literacy and numeracy development when teaching through learners' mother tongue. As Creswell and Poth (2018) explain, qualitative research enables a rich, in-depth understanding of educational practices and the contextual factors that influence them, rather than relying on measurable or predetermined variables.

A qualitative research design was employed to facilitate an in-depth exploration of mother-tongue instruction within authentic classroom settings. The study drew on classroom observations and semi-structured interviews to generate rich, contextualised data on instructional practices and participants' experiences in selected Foundation Phase schools. This approach enabled the researcher to examine the phenomenon as it occurred naturally in real-life educational contexts, yielding nuanced insights into how mother-tongue instruction is enacted and perceived in everyday classroom practice.

A purposive sample of Foundation Phase teachers was selected because they have direct experience implementing mother-tongue instruction and teaching literacy and numeracy in the early grades. Fifteen (15) teachers from Grades R to 3 were purposefully chosen across several schools to ensure variation in experience, grade level, and school context. This sampling strategy ensured that participants were information-rich and able to offer insights into how literacy and numeracy skills develop concurrently when taught through the home language.

Data was collected through semi-structured interviews and classroom observations, enabling a detailed exploration of teachers' practices and perspectives. Semi-structured interviews provided opportunities to probe teachers' reasoning, experiences, and interpretations regarding the use of mother-tongue instruction in literacy and numeracy development (Saunders et al., 2019).

Classroom observations complemented the interviews by enabling the researcher to witness actual instructional practices, language use, and learner responses during literacy and numeracy lessons. All interviews and observation sessions were audio-recorded with participants' consent and transcribed verbatim to preserve participants' voices' authenticity.

Data analysis was conducted using Braun and Clarke's (2021) thematic analysis framework. This involved familiarisation with qualitative data, generating initial codes, organising codes into broader themes, and interpreting these themes in relation to the research questions and existing literature. Thematic analysis was suitable for this study, as it allowed the researcher to identify patterns in how teachers understood and enacted mother-tongue instruction in their classrooms, and how these practices shaped interactions between literacy and numeracy learning.

To ensure the study's trustworthiness, Lincoln and Guba's (1985) criteria of credibility, transferability, dependability, and confirmability were rigorously applied. Credibility was enhanced through member checking, where participants verified the accuracy of the interpretations. Dependability was strengthened by maintaining an audit trail that documented all decisions and processes throughout data collection and analysis. Detailed descriptions of the school contexts and instructional environments enhanced the transferability of the findings, enabling readers to assess the applicability of the results to other settings. Confirmability was ensured through triangulation of interview and observation data and through reflexivity throughout the research process.

Ethical considerations were central to the study. Ethical clearance was obtained from the relevant university ethics committee, and permission was sought from provincial education authorities and school principals. Participation was voluntary, and all teachers provided informed consent. Confidentiality and anonymity were maintained through the use of pseudonyms, and all audio recordings and transcripts were securely stored. Conducting the study within a small number of Foundation Phase schools enabled an in-depth understanding of the sociocultural, linguistic, and pedagogical factors that influence how teachers navigate literacy and numeracy development in mother-tongue instruction. Overall, the methodology provided a coherent and contextually grounded framework for examining how early learning unfolds when mediated through the home language.

4. Results and Findings

Data collected from interviews, classroom observations, and document analysis revealed four key themes regarding the role of mother-tongue instruction in literacy and numeracy development in Foundation Phase classrooms. The analysis follows a thematic framework directly linked to the study's research questions, providing insight into the attitudes, experiences, and perceptions of both teachers and learners regarding the use of their home language as the medium of instruction.

4.1 Theme 1: Recognition of the Importance of Mother-Tongue Instruction in Literacy and Numeracy Development

Findings from the study revealed that both teachers and participants consistently recognized mother-tongue instruction as a crucial tool for foundational literacy and numeracy learning. Most participants emphasized that using learners' home language helped them explain concepts more clearly and ensured learners understood the content more effectively. For example, one teacher observed, "When I teach reading and math in Xitsonga, children grasp the ideas faster and participate actively in lessons." This recognition reflects a positive attitude toward mother-tongue instruction, grounded in the understanding that it provides a bridge between home and school learning, promotes comprehension, and enables meaningful engagement with new knowledge, consistent with Cummins' Linguistic Interdependence Theory (Cummins, 2021).

"When I use the learners' home language, especially Xitsonga, they understand reading and counting much faster because I do not have to translate everything into English." P2

"Children respond immediately when lessons are in their own language; they are not afraid to speak or try." P4

Participants highlighted that mother-tongue instruction improved learners' comprehension and engagement. Observations showed that learners who read aloud and discussed stories in their home language demonstrated greater fluency and understanding than those in lessons taught in English. Teachers noted that learners were more confident asking and answering questions and could connect concepts across subjects when lessons were conducted in a familiar language. These insights align with previous studies indicating that early literacy and numeracy development is facilitated when learners are instructed in the language they understand, as it strengthens cognitive processing and scaffolds subsequent learning in additional languages (Leighton, 2022; Naddumba & Athiemoolam, 2022).

"Learners ask more questions and even correct each other when they understand the language of teaching." P1

Teachers further emphasized the professional significance of mother-tongue instruction in fostering effective teaching practices. One participant remarked, "Children learn more effectively when we use the language they understand; it helps them internalize new concepts in reading and mathematics." Vygotsky's sociocultural theory supports this observation, asserting that learning is mediated through language and social interaction, which serve as cognitive and cultural tools to support understanding and skill development (Vygotsky, 1978; Leighton, 2022). Participants perceived mother-tongue instruction not merely as a pedagogical strategy but as an essential medium for building trust, promoting learner engagement, and supporting meaningful classroom interactions.

"If a learner understands the story or the question in their language, solving the maths problem becomes easier." P5

"Reading helps them understand instructions in numeracy, and numeracy helps them think logically when they read." P8

Participants observed that mother-tongue instruction fostered learner confidence in both literacy and numeracy tasks. Learners were more willing to attempt new reading exercises and solve mathematical problems when content was delivered in a familiar language. Teachers reported that confidence increased because learners could focus on the concept rather than struggling with language barriers. This finding underscores the role of affective factors in learning, aligning with Lightbown and Spada's (2021) assertion that positive attitudes toward language and cognitive development in the instructional medium enhance motivation, engagement, and academic performance, thereby facilitating smoother transitions to problem-solving and higher-order literacy tasks.

Additionally, participants emphasized that mother-tongue instruction facilitated cross-domain reinforcement between literacy and numeracy skills. Teachers explained that reading comprehension and vocabulary supported learners' understanding of mathematical problems, while numeracy exercises encouraged logical thinking and sequencing, thereby strengthening literacy development. Classroom observations revealed that learners frequently employ comprehension strategies to effectively interpret problem-solving questions. One teacher remarked, "When children understand the language of the question, they solve math problems better; reading and math support each other," illustrating the dynamic interdependence between literacy and numeracy in early learning environments.

Participants also noted that the home language created a culturally relevant and inclusive learning space. Learners felt valued and respected when instruction aligned with their linguistic background, enhancing their willingness to participate. Teachers observed that learners could draw prior knowledge and everyday experiences to between concepts, which reinforced understanding and encouraged meaningful engagement in lessons. These findings align with research suggesting that culturally and linguistically responsive instruction fosters both cognitive and affective development, ensuring learners are active participants in their own learning process (Trujillo, 2020).

Furthermore, teachers observed that mother-tongue instruction helped scaffold second-language acquisition over time. Learners who had a strong foundation in their home language showed increased competence when transitioning to English instruction later, as they could transfer literacy and numeracy skills. This observation aligns with Cummins' theoretical perspective on cross-linguistic transfer, which posits that skills developed in the first language can support learning in additional languages, particularly when systematic scaffolding and instructional support are provided (Cummins, 2021).

In conclusion, Theme 1 demonstrates that participants recognize mother-tongue instruction as critical for literacy and numeracy development. The use of learners' home language promotes comprehension, engagement, confidence, cross-domain reinforcement, and culturally responsive pedagogy. These findings underscore the foundational role of the mother tongue in early education and provide

evidence for sustaining home-language instruction as a strategy for improving learners' literacy, numeracy, and cognitive development.

4.2 Theme 2: Challenges in Implementing Mother-Tongue Instruction

Despite acknowledging its importance, participants reported multiple challenges in implementing mother-tongue instruction effectively in Foundation Phase classrooms. A recurring issue was the limited availability of teaching and learning resources in local languages. Teachers frequently mentioned the scarcity of textbooks, workbooks, and storybooks in Xitsonga, Tshivenda, or other mother tongues, which limited their ability to plan and deliver lessons effectively. One teacher stated, "We want to teach in Xitsonga, but most textbooks and workbooks are in English, which makes planning difficult." The lack of resources thus hinders both literacy and numeracy instruction, forcing teachers to rely on improvisation, which can compromise lesson quality and learner engagement (Khanyile & Awung, 2023).

"Most of the materials we receive are written in English, so even if the policy says we must teach in the mother tongue, the resources do not support us." P9

"We want to teach reading and numeracy in Xitsonga, but there are very few storybooks and maths activities available in the language." P13

Teacher proficiency in the mother tongue also emerged as a major challenge. Some educators reported lacking formal training to teach complex numeracy concepts or advanced literacy tasks in their home language. One participant noted, "I sometimes struggle to explain fractions in Xitsonga because the terminology is not standardized, and I am unsure how to introduce certain concepts." This lack of linguistic confidence undermines lesson delivery and can affect learners' comprehension, particularly in abstract or problem-solving tasks. Professional development and training in mother-tongue pedagogy were repeatedly suggested as key solutions to this challenge, consistent with findings by Makena and Nzabe (2025).

One teacher noted, "Explaining things like fractions or problem-solving steps in Xitsonga is difficult because some mathematical terms do not have clear equivalents." P15

Another participant stated, "Sometimes I know the concept, but I am not confident that I am explaining it correctly in the home language." P7

Participants highlighted limited learner exposure to the mother tongue outside the classroom as another constraint. In multilingual communities, children often spoke different languages at home or were exposed to English through the media, which sometimes led to inconsistent reinforcement of the instructional language. One teacher explained, "At home, children speak different mother tongues or English, so consistency in using one language is difficult." This irregular exposure reduces fluency, slows vocabulary development, and affects learners' ability to apply reading and numeracy skills across contexts, illustrating the importance of home-school alignment in language learning (Alimi et al., 2020).

“At school, we use the home language, but at home, learners speak different languages or mostly English, so they do not practice enough.”
P1

Systemic and policy-related challenges were also evident. Teachers reported that, although official language policies encourage mother-tongue instruction in early grades, pressures to transition learners to English prematurely hindered sustained implementation. Some learners became confused when transitioning between languages too early, negatively impacting both reading comprehension and problem-solving abilities in mathematics. One teacher remarked, “Sometimes children get mixed up because English lessons start too early, which slows their progress in Xitsonga.” These policy-practice gaps underscore the need for coherent language planning that aligns with developmental readiness (Trujillo, 2020).

One participant remarked, “There is pressure to prepare learners for English, so sometimes we switch too early, and the children become confused.” P12

Another teacher noted, “When English is introduced before learners are ready, it affects both reading and maths because they struggle to understand instructions.” P11

Socioeconomic and contextual factors further affected the implementation of mother-tongue instruction. Learners from low-income families often had limited access to books, digital resources, or parental support at home, which constrained the development of literacy and numeracy skills. Teachers observed that these learners required more structured classroom scaffolding to achieve learning outcomes comparable to those of their peers with richer language environments. One participant explained, “Without resources at home, we must provide extra support at school, but sometimes we don’t have enough materials or time to do so effectively.” This finding aligns with Salie and Moletsane (2021), who emphasize the influence of social context on educational outcomes in resource-constrained environments.

“Many learners do not have books at home, so everything must happen at school.” P15

Another added, “We try to support them, but with large classes and limited time, it becomes difficult to give individual attention.” P5

Participants also reported insufficient institutional support as a significant barrier. While teacher training programs introduced the concept of mother-tongue instruction, few practical workshops or mentoring opportunities were available to guide effective lesson planning. One teacher stated, “We need more guidance and resources to implement mother-tongue teaching properly, especially for math.” This aligns with Vygotsky’s sociocultural theory, which emphasizes the importance of scaffolding and guided participation in learning, suggesting that without structured institutional support, teachers and learners are limited in their ability to maximize the benefits of mother-tongue instruction (Lantolf & Thorne, 2020).

Theme 2 demonstrates that the challenges of implementing mother-tongue instruction are multifaceted, encompassing resource scarcity, teacher proficiency, limited learner exposure, policy-practice gaps, and socioeconomic constraints. Addressing these barriers is crucial for optimizing literacy and numeracy outcomes in Foundation Phase classrooms. Targeted interventions, including professional development, resource provision, and policy alignment, are necessary to ensure that mother-tongue instruction achieves its full potential in early learning environments.

4.3 Theme 3: Interaction Between Literacy and Numeracy Skills under Mother-Tongue Instruction

Findings revealed a strong interaction between literacy and numeracy skills when instruction was delivered in the mother tongue. Teachers reported that learners' reading comprehension significantly facilitated their understanding of mathematical problems, particularly word problems that required interpreting instructions and identifying relevant operations. One participant explained, "Children can solve a math problem better when they understand the question; reading and math go hand in hand." Observations confirmed that learners proficient in reading their home language could extract key information and apply appropriate problem-solving strategies, demonstrating the interdependence of literacy and numeracy in early learning environments (Bezuidenhout, 2022).

One teacher explained, "If a learner understands the question in their own language, they already know what the problem is asking; then the maths becomes easier." P7

Another participant similarly noted, "Reading and maths work together; when children read well in their home language, they solve maths problems with more confidence." P2

Participants highlighted how numeracy exercises also reinforced literacy skills. For example, logical reasoning, sequencing, and problem-solving activities in mathematics encouraged learners to develop critical thinking skills that could be applied to reading comprehension and writing tasks. Teachers observed that learners often used strategies such as identifying patterns, organizing information, and predicting outcomes in both mathematics and reading exercises. One teacher remarked, "When learners solve multi-step math problems, they also practice sequencing and reasoning, which helps them structure their writing and understand texts better." This observation underscores the cognitive links between literacy and numeracy development (Shvartsman & Shaul, 2023).

"When learners solve multi-step maths problems, they learn how to think step by step, and this helps them organise their ideas when they write or answer reading questions." P3

Maths teaches them logic, and that same logic helps them understand stories and questions in reading." P6

Peer discussions emerged as an important mechanism mediating the interaction between literacy and numeracy skills. Teachers reported that learners frequently explained mathematical problems to each other in their mother tongue, which

required them to use accurate vocabulary, articulate reasoning, and structure explanations logically. One participant noted, "When learners discuss math questions together, they also practice language skills because they must explain clearly." This finding aligns with Vygotsky's Sociocultural Theory, which posits that learning occurs through social interaction and scaffolding within the Zone of Proximal Development, enabling learners to internalize knowledge while developing both cognitive and language skills (Vygotsky, 1978).

When learners explain a maths problem to each other, they are also practising language because they must use the correct words and explain their thinking." P11

Participants emphasized that mother-tongue instruction created a safe environment for learners to take risks in both literacy and numeracy. Learners were more willing to attempt complex calculations or write extended responses when they could rely on familiar linguistic structures. Teachers observed that confidence in the instructional language reduced anxiety and promoted engagement across both domains. One teacher explained, "Children are not afraid to make mistakes when they understand the language, and they participate more actively in reading and math activities." This finding highlights the affective dimension of learning and the importance of language familiarity in supporting academic risk-taking and skill development (Alimi et al., 2020).

One participant explained, "Children are not scared to try difficult maths or write longer answers because they understand the language being used." P14

Another teacher added, "They make mistakes, but they are confident to try again because they are comfortable with the language." P7

Teachers also reported that integrated lesson plans reinforced the reciprocal relationship between literacy and numeracy. For example, story-based math problems and reading comprehension exercises were used to develop vocabulary, critical thinking, and problem-solving skills simultaneously. Observations revealed that learners could read instructions, comprehend meaning, and apply numeracy strategies without external guidance. One teacher remarked, "By using stories to teach math, children improve their reading and understand concepts faster." This approach demonstrates the benefits of cross-curricular integration, supporting the notion that literacy and numeracy reinforce each other when taught in meaningful contexts (Chang, 2023).

"When we use stories to teach maths, learners improve their reading and understand the maths concepts much faster." P10

"Combining reading and maths in one lesson helps learners see that the skills are connected." P8

Participants also highlighted that the mother tongue enabled learners to draw on prior knowledge and cultural experiences when engaging in literacy and numeracy tasks. Familiar language structures allow learners to make sense of abstract concepts and transfer knowledge across contexts. Teachers observed that learners could relate mathematical problems to real-life scenarios, improving both understanding and retention. One teacher explained, "When we teach math in the

language they speak at home, children can connect the concepts to daily life, which helps them remember and apply what they learn.” This reinforces the cognitive and cultural benefits of using the mother tongue as the medium of instruction (Esuong et al., 2024).

Participants noted that consistent use of the mother tongue in both literacy and numeracy enhanced learners’ overall academic performance. Learners showed increased fluency in reading, improved comprehension, and stronger problem-solving skills when instruction was systematically delivered in their home language. Teachers also observed that learners could transfer these skills when later exposed to English, demonstrating cross-linguistic transfer and cognitive scaffolding benefits. This finding aligns with Cummins’ Linguistic Interdependence Theory, which posits that competence developed in the first language can support the acquisition of additional languages and academic skills (Cummins, 2021).

In summary, Theme 3 illustrates that literacy and numeracy skills are mutually reinforcing under mother-tongue instruction. The interaction between these domains is facilitated by peer discussion, integrated lesson planning, safe learning environments, and culturally relevant language use. These findings highlight the critical importance of using the mother tongue as a mediating tool for cognitive development, supporting both foundational literacy and numeracy in the early years of schooling.

4.4 Theme 4: Contextual Factors Influencing Mother-Tongue Instruction

The study revealed that contextual factors significantly influenced the implementation and effectiveness of mother-tongue instruction in Foundation Phase classrooms. Teachers reported that presented both opportunities and challenges. In classrooms where learners speak multiple home languages, teachers often struggle to deliver lessons that accommodate everyone. One participant noted, “In one class, some children speak Tshivenda, others Xitsonga, and a few speak English at home. It is difficult for everyone to use one language. This complexity underscores the need for flexible, inclusive strategies that account for the multilingual realities of rural schools (Salie & Moletsane, 2021).

“In one class you find learners who speak Tshivenda, others Xitsonga, and some are exposed mainly to English, so choosing one language becomes very difficult.” P5

Socioeconomic conditions were identified as a major factor shaping learning outcomes. Learners from low-income families often had limited access to educational resources such as books, stationery, and digital tools, which affected their literacy and numeracy development. Teachers emphasized that these constraints required additional scaffolding in classrooms to ensure equitable learning opportunities. One teacher stated, “Some learners cannot afford reading materials at home, so we have to provide extra support in school.” This finding aligns with prior research indicating that poverty and limited material resources significantly impact the quality of early education, particularly in rural contexts (Makena & Nzabe, 2025).

One participant noted, *“Many learners do not have reading materials at home, so all the learning must happen at school.”* P6

Another participant explained, *“Because of poverty, we have to spend more time supporting some learners, but the resources are limited.”* P3

The availability and quality of teacher training in mother-tongue instruction emerged as a critical contextual factor. Participants highlighted that many educators had limited exposure to formal training on teaching literacy and numeracy in local languages. This lack of preparation affected their confidence and ability to scaffold learning effectively. One participant explained, *“We are taught theory at university, but when it comes to teaching reading and math in Xitsonga, I sometimes feel unprepared.”* These findings emphasize the importance of ongoing professional development and mentoring to equip teachers with strategies for implementing effective mother-tongue instruction (Khanyile & Awung, 2023).

“We learned the theory at university, but teaching reading and maths in Xitsonga is very challenging in practice.” P14

Parental attitudes and community support also influenced the success of mother-tongue instruction. Teachers reported that when parents valued and reinforced learning in the home language, learners demonstrated higher engagement and confidence in both literacy and numeracy. Conversely, in communities where English was prioritized as the language of prestige, learners sometimes resisted using their home language in school. One participant noted, *“Some parents insist that children learn English only, which makes it difficult to encourage reading and problem-solving in Xitsonga or Tshivenda.”* This finding underscores the socio-cultural dimension of language learning, where home attitudes can either reinforce or hinder instructional strategies (Makokha, 2024).

“Some parents believe that English is better, so they do not encourage their children to read or do maths in their home language.” P12

“This makes it difficult because learners feel that their language is not important.” P8

Institutional factors, including classroom size, availability of teaching materials, and administrative support, also played a role in shaping instructional effectiveness. Teachers highlighted that overcrowded classrooms made it difficult to provide individualized attention, while a lack of cultural and linguistically appropriate resources hindered the teaching of literacy and numeracy. One teacher explained, *“Even when we know the strategies, the class is too big, and we don’t have enough books or manipulatives for everyone.”* These structural constraints demonstrate the need for systemic interventions to support both teachers and learners in rural schools (Salie & Moletsane, 2021).

“Even if you know the strategies, it is difficult to support every learner when the class is too big.” P4

Policy and curriculum frameworks influenced how mother-tongue instruction was implemented. Teachers reported inconsistencies between official language policies and classroom realities, such as the early introduction of English in areas

where learners had limited exposure. One participant stated, “The curriculum says we should use the mother tongue, but then English starts too early, and children get confused.” These gaps between policy and practice often undermine both literacy and numeracy outcomes, suggesting that curriculum design should be aligned with learners’ linguistic readiness and local contexts (Trujillo, 2020).

Theme 4 illustrates that the effectiveness of mother-tongue instruction is shaped by an interplay of contextual factors, including linguistic diversity, socioeconomic conditions, teacher training, parental attitudes, institutional resources, and policy frameworks. Addressing these factors is essential for promoting inclusive, high-quality education in Foundation Phase classrooms. Effective implementation requires not only pedagogical strategies but also systemic support and alignment with learners’ social, cultural, and linguistic realities.

5. Recommendations

Based on the findings of this study, several specific recommendations are proposed to enhance literacy and numeracy development under mother-tongue instruction in Foundation Phase classrooms, particularly in rural South African schools. Teacher education programs should explicitly integrate mother-tongue pedagogical strategies into core modules such as Foundations of Literacy, Numeracy Teaching, and Teaching Practice. Lecturers can design activities that promote authentic interaction, including story-based numeracy exercises, role-play, and problem-solving tasks that simultaneously develop literacy and mathematical skills. Assessment should evaluate learners’ abilities in both domains, using methods such as oral explanations of math problems, reading comprehension exercises, and reflective journals to reinforce literacy and numeracy skills cohesively.

Schools and universities should establish informal, peer-led platforms that foster collaborative learning in the mother tongue. Literacy and numeracy clubs, discussion groups, or peer mentoring sessions facilitated by teachers or senior students can provide safe spaces for learners to practice reading, writing, and mathematical reasoning in familiar languages. These forums allow learners to explain concepts to one another, receive immediate feedback, and develop confidence in using their home language for academic purposes. Regular events, such as “Mother-Tongue Literacy Days” or community math challenges, can promote consistent engagement and make learning enjoyable and culturally relevant.

Institutional support structures must be strengthened to provide additional scaffolding for mother-tongue instruction. Schools should be equipped with books, manipulations, story materials, and digital resources in local languages to support the development of literacy and numeracy. Workshops focusing on effective teaching strategies, code-switching, and cross-linguistic scaffolding can equip teachers with practical methods to integrate literacy and numeracy instruction effectively. Collaboration between curriculum planners, teacher educators, and school leadership can ensure a coherent approach that aligns

resources, policies, and instructional practices with learners' linguistic and cognitive needs.

Opportunities for multilingual and community-based learning should be expanded. Learners could participate in local literacy campaigns, community numeracy projects, or peer-teaching programs that allow them to apply reading, writing, and math skills in real-life contexts. Exposure to diverse linguistic and mathematical problem-solving scenarios can strengthen conceptual understanding and cultural awareness. Partnerships with urban or better-resourced schools could provide additional mentorship and resource-sharing opportunities, enabling learners to experience varied approaches to mother-tongue instruction and integrated literacy and numeracy development.

Professional development for teachers should focus on mother-tongue pedagogy and on integrating literacy and numeracy skills. Training programs should include methods for scaffolding reading and writing while teaching numeracy concepts, developing contextually relevant materials, and using formative assessment to monitor progress in both domains. Teachers should be encouraged to reflect on their instructional practices, collaborate with colleagues, and implement evidence-based strategies that enhance learners' cognitive, linguistic, and numeracy skills.

Implementing these target recommendations will provide learners with consistent opportunities to develop literacy and numeracy skills in their mother tongue, thereby strengthening comprehension, problem-solving, and critical thinking. While peer collaboration and classroom activities support learning, institutional backing, professional development, and curriculum integration are crucial for ensuring effective mother-tongue instruction. These measures will empower teachers and learners alike, fostering positive attitudes, academic confidence, and holistic cognitive development in Foundation Phase education.

6. Conclusion

This article highlights that mother-tongue instruction significantly enhances both literacy and numeracy development among learners in the Foundation Phase of rural South African schools. Learners demonstrate improved comprehension, problem-solving, and critical thinking skills when taught in their home language, emphasizing the interdependence of literacy and numeracy. Despite these benefits, the effectiveness of mother-tongue instruction is constrained by contextual challenges, including limited teaching resources, gaps in teacher proficiency, linguistic diversity in classrooms, and inconsistent policy implementation. Peer interaction emerged as a crucial resource, providing informal scaffolding and collaborative learning opportunities; however, these alone cannot fully replace structured institutional support and targeted interventions.

The findings underscore the necessity for teacher education programs and schools to integrate mother-tongue literacy and numeracy activities into curricula, complemented by peer-led platforms, community-based projects, and culturally

relevant learning materials. Professional development for teachers focusing on mother-tongue pedagogy and scaffolding strategies is essential for enhancing instructional effectiveness. Aligning with Vygotsky's Sociocultural Theory, the study demonstrates that learning is mediated through social interaction, peer collaboration, and guided support, emphasizing that both peer and institutional scaffolding are crucial for developing competence and confidence in using the home language for academic purposes (Vygotsky, 1978). Implementing these strategies will equip teachers and learners to create language-rich, inclusive classrooms that foster cognitive, linguistic, and academic growth in the Foundation Phase.

7. Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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