THE EFFECTS OF TEACHING MATHEMATICS USING HOME LANGUAGE IN FOUNDATION PHASE

BY

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DECLARATION

I, **LUSANI RANDIMA,** declare that **THE EFFECTS OF TEACHING MATHEMATICS USING HOME LANGUAGE IN FOUNDATION PHASE** is my work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references, and that this work has not been submitted before for any other degree at any other institution.

LUSANI RANDIMA

..... 21/01/2025

Full names **Date**

DEDICATION

I dedicate this study to my mother, whose unwavering support and belief in me made this journey possible. Your love and encouragement have been my constant motivation. To my supervisor, Dr. M.G SIKHWARI, for their guidance, patience, and expertise.

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ABSTRACT

Language plays a crucial role in cognitive development, particularly in mathematics learning during early childhood education. However, the linguistic diversity in South African classrooms presents challenges, as home languages often differ from the language of instruction. This study investigates the effects of using home language in teaching Mathematics in Foundation Phase classrooms across selected schools in the Sibasa Circuit in the Vhembe East District of Limpopo Province. Guided by Lev Vygotsky's Sociocultural Theory, which emphasizes the importance of social interaction and language in learning, the study adopted a qualitative research paradigm to explore participants' experiences and perceptions in depth. A case study research design was employed to provide a comprehensive understanding of the phenomenon within its real-life context. Data was collected through semi-structured interviews, classroom observations, and document analysis. The study's population comprised Foundation Phase Mathematics teachers, heads of departments (HODs), curriculum advisors, and parents in the Sibasa Circuit. Using a purposive sampling procedure, 32 participants were selected, including 10 Foundation Phase Mathematics teachers (Grades R-3), 15 parents, 5 Foundation Phase Departmental Heads, and 2 Curriculum Advisors. Manual thematic analysis was used to analyse the data, identifying key themes and patterns related to home language use in mathematics instruction. The study was delimited to selected schools within the Sibasa Circuit for in-depth exploration. Trustworthiness is ensured through credibility, transferability, dependability, and confirmability. Ethical considerations, including informed consent, confidentiality, and voluntary participation, were strictly observed. The findings indicate that learners demonstrate improved comprehension and engagement when mathematics is taught in their home language. Nevertheless, teachers face challenges in translating complex mathematical concepts, which sometimes leads to inconsistencies in terminology. Based on these findings, the study recommended the integration of bilingual teaching strategies to support concept development and the implementation of professional development programs to enhance teachers' skills in teaching mathematics using the home language. This study highlights the importance of home language in enhancing mathematical understanding in the Foundation Phase while also addressing the need for structured support to overcome linguistic barriers in instruction.

KEY CONCEPTS: *Foundation Phase, Home Language, Language Proficiency, Mathematics Instruction, Parental Involvement.*

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ACRONYMS

CAPS= Curriculum Assessment policy statement

DoE= Department of Education

FP= Foundation Phase

HOD(s)= Head of Department.

LoLT= Language of Learning and Teaching

SDG= Sustainable Developmental Goals

ZPD= Zone of Proximal Development

CHAPTER 1: INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 INTRODUCTION AND BACKGROUND

Using learners' home languages as the medium of instruction in early mathematics education has gained significant recognition, with researchers advocating for this method based on theoretical and practical considerations (Garcia et al., 2021). The shift from universally using standard languages stems from the understanding that leveraging learners' existing linguistic repertoires and cultural reference points may enhance their learning processes (Bowie, 2022). Proponents of this approach argue that integrating home language into formal mathematics instruction in early grades allows learners to connect new information to familiar contexts, retain mathematical concepts in their long-term memory, and better understand abstract ideas by linking them to everyday experiences (Ngcobo & Mlambo, 2021). By employing home languages in instruction, learners are more likely to recognise the practical significance of mathematical concepts in their lives and future aspirations.

The theoretical foundation of this argument is supported by scholars who contend that using the learners' home languages in early mathematics instruction improves comprehension, facilitates communication between teachers and learners, and nurtures cultural identity (Essien & Sapire, 2022). Garcia et al., 2022) and Civil (2022) also highlight that the language of instruction in the Foundation Phase substantially impacts comprehension, engagement, and mathematical performance, particularly within the South African context.

However, critics of home language instruction raise concerns regarding its potential drawbacks. These include the argument that home languages often lack the specialised terminological vocabulary needed for precise mathematical instruction, which may hinder the teaching of complex concepts. Additionally, the use of non-standard languages can impede learners' transition to official instructional languages, reduce access to educational resources predominantly available in global languages, and perpetuate inequalities (Han, 2022; Makaluza & Mpeta, 2022). These opposing viewpoints suggest that while home language instruction may have cognitive and cultural benefits, it could also introduce challenges in the broader educational landscape.

Further complicating the debate is the issue of systemic and pedagogical obstacles to the implementation of home language instruction. The linguistic registers required for academic discourse in local vernaculars remain largely unstandardised, making it difficult to convey complex mathematical concepts with the necessary terminological accuracy (Makaluza & Mpeta, 2022). Additionally, the lack of supporting curricular materials, assessment tools, and teacher training programmes tailored to home language instruction presents a significant barrier to its widespread adoption (Garcia

et al., 2021). These resources are essential for aligning teaching practices with mandated learning standards and benchmarks.

This study aims to contribute to the ongoing discourse by examining the effects of using home languages to teach mathematical concepts in early childhood settings. By focusing on empirical and subjective data, this research will explore the impacts on comprehension, learner engagement, and educational outcomes. The findings will provide insights into how home language instruction influences mathematical performance, potentially informing language policies and pedagogical practices in South African foundation phase mathematics education.

1.2 STATEMENT OF THE PROBLEM

The effectiveness of teaching mathematics in the Foundation Phase is crucial for laying a strong academic foundation for young learners. Though, in many contexts, learners are often taught in a second or third language, which can pose significant barriers to comprehension, engagement, and academic performance. In South Africa, learners in the Foundation Phase frequently face challenges when mathematics is taught in English or another language, which can hinder their understanding and problem-solving abilities (Fadilah & Sitaresmi, 2024).

This problem is particularly significant considering Sustainable Development Goal 4 (SDG 4), which emphasizes ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all. To achieve SDG 4, it is essential to explore innovative and culturally relevant pedagogical strategies that can enhance learning outcomes for young children, particularly in mathematics (Jojo, 2024). Despite existing literature that supports the role of home language in early literacy development, there is a gap in research specifically regarding its impact on mathematics learning in the early grades. The problem that this study seeks to address is whether teaching mathematics in learners' home language in the Foundation Phase can improve their understanding of mathematical concepts, foster a deeper engagement with the subject, and ultimately contribute to better educational outcomes in line with SDG 4.

Therefore, this study will investigate the effects of teaching mathematics using learners' home language in the Foundation Phase, with the aim of providing insights

into how this approach can contribute to improving the quality of education and achieving Sustainable Development Goal 4 for all learners.

1.3 RESEARCH AIM AND OBJECTIVES

1.3.1. AIM OF THE STUDY

The aim of this study is to explore the effects of teaching mathematics using the home language in the Foundation Phase

1.3.2. OBJECTIVES

- To examine the potential benefits of using learners' home languages to teach mathematics in the Foundation Phase
- To investigate the effects of using home languages as the medium of instruction for mathematics
- To identify systemic and pedagogical barriers faced when implementing home language-based mathematics instruction.
- To explore effective teaching strategies and best practices for home language-centred mathematics pedagogy

1.4 RESEARCH QUESTIONS

1.4.1. THE MAIN RESEARCH QUESTION

What are the effects of teaching mathematics using the home language in the Foundation Phase?

1.4.2. THE SUB-RESEARCH QUESTIONS

- What are the potential benefits of using learners' home languages to teach mathematics in the Foundation Phase?

- What are the effects of using home languages rather than standardized languages to teach mathematics?

- What are the systemic and pedagogical barriers do teachers encounter when attempting to leverage home languages for mathematics instruction?

- What are the teaching strategies and best practices for home language-centred mathematics pedagogy?

1.5 DEFINITION OF CONCEPTS

1.5.1. Home language

Home language refers to the primary language spoken in a person's household or home environment. It's often the language used for communication among family members, especially in childhood, and can have significant cultural and emotional ties, (Civic, 2022). This term is sometimes used interchangeably with "native language" or "mother tongue," although it specifically focuses on the language spoken at home rather than the broader concept of a person's first language or ethnic background.

1.5.2. Foundation Phase

The Foundation Phase refers to the early years of formal education, typically covering the first few grades of schooling (from Grades R-3), usually from ages 5 to 9 (Garcia et al., 2021). It focuses on building children's basic skills and knowledge for further learning. In this phase, the emphasis is on foundational skills in subjects like literacy, numeracy, and social development, with a strong focus on active learning and play. The goal is to lay the groundwork for academic success by fostering essential skills such as communication, problem-solving, and critical thinking.

1.5.3. Mathematics instruction

Mathematics instruction refers to the process of teaching and guiding learners in learning mathematical concepts, skills, and problem-solving techniques,(Cummins 2020). It involves the use of various teaching methods, resources, and strategies to help learners understand and apply mathematical ideas, ranging from basic arithmetic to advanced topics like algebra, geometry, and calculus. The goal is to develop learners' mathematical thinking, reasoning, and ability to apply math in real-world contexts. Mathematics instruction can take place in various settings, including classrooms, tutoring sessions, and online learning platforms.

1.5.4. Language proficiency

Language proficiency refers to the degree to which an individual has mastered a language’s vocabulary, grammar rules, and pragmatic conventions to convey intended meanings fluently (Benson, 2022). In this study, language proficiency refers specifically to competency in the home language/mother tongue used for mathematical instruction and communication.

1.5.5. Parental involvement

Parental Involvement refers to active participation, support, and collaborative assistance provided by parents and family members to reinforce children's foundational mathematics skills development spanning school and home settings

(Makaluza & Mpeta, 2022). This comprises involvement both through at-home activities and through volunteering in school-based initiatives.

1.6 SIGNIFICANCE OF THE STUDY

This study investigates the incorporation of home languages into early mathematics teaching. It is valuable for various individuals and groups who seek to change the education system's exclusionary hierarchies. The goal is to establish more equitable and culturally sustaining models that view diversity as a strength rather than conforming to dominant paradigms (Benson, 2022). The acquired knowledge can be used by teachers to enhance teacher professional development in the areas of facilitating mathematical understanding through code-switching, creating learning materials that integrate learners' cultural backgrounds, developing standardised assessments in languages spoken by marginalised communities, and promoting collaborative communities focused on anti-deficit approaches (Makalela, 2020).

The uniqueness of this study is that the curriculum advisors can use the research findings to guide the revision of linguistic policies, ensuring a balance between functional requirements and the promotion of linguistic diversity, especially during the transitional years when learners are exposed to both their home language and the language used at school. Benson (2022) stated that parents from linguistically marginalised populations might be motivated to increase fundamental support based on evidence of greater confidence, engagement, and mathematical identities. Documenting the symbolic interactions that shape this experiential event contributes to the literature on sociocultural theory and critical mathematics education from a theoretical perspective. The complex significance of this concept encompasses various aspects, including its practical, transformative, empirical, and theoretical dimensions. It sheds light on current realities and aims to restructure future learning experiences to be more inclusive, (Garcia et al., 2022)

1.7 STRUCTURE OF THE RESEARCH PROJECT

Chapter 1: INTRODUCTION AND BACKGROUND OF THE STUDY

This section serves as an introduction to the research by covering relevant context and topics. The statement of the problem, the importance of the research, and the

purpose of the investigation will all fall under this category. In this chapter, we go over the study's aims, provide some questions to probe further, and define certain words that will be used throughout.

Chapter 2: LITERATURE REVIEW

Here, the chapter will look at the research done on research works by other authors for a holistic understanding of the topic. The study's objectives will determine the chapter's content.

Chapter 3: METHODOLOGY

This chapter will discuss the approach that will be used to carry out the research. In this chapter, the research paradigm will be broken down. In addition, this chapter will detail the study strategy, methodology, and sample procedures. The process of data collection and analysis will also be revealed.

Chapter 4: DATA PRESENTATION

The results of the observation, document analysis, and interviews will be presented and discussed in this section.

Chapter 5: CONCLUSIONS AND RECOMMENDATION

This last chapter will provide a comprehensive overview of the whole study. The chapter will also detail the reasoning behind the study's findings. The facts and conclusions will then be used to inform recommendations.

1.8. CONCLUSION

This chapter provides an overview of the impact of using home languages in teaching mathematics in the Foundation Phase. It emphasizes how integrating home languages into early mathematics education can improve learners' understanding, engagement, and retention of mathematical concepts, especially in contexts such as South Africa, where language barriers may present significant challenges. Advocates argue that home language instruction helps bridge abstract mathematical ideas with real-world experiences, while critics caution that it may hinder learners' transition to formal

educational languages and present challenges due to the lack of specific mathematical terminology in their home language.

This study seeks to examine how home language instruction in mathematics affects comprehension, engagement, and outcomes, aiming to inform educational practices and policies in alignment with Sustainable Development Goal 4, which promotes inclusive and equitable quality education. The chapter outlines specific objectives and presents the problem statement. Additionally, key concepts are discussed, and an overview of the structure of the study is provided, from Chapter 1 through Chapter 5. The next chapter, Chapter 2, will present a literature review that explores existing research on the effects of using home language in teaching mathematics in the Foundation Phase.

CHAPTER 2: LITERATURE REVIEW

2.1. INTRODUCTION

The aim of this study is to explore the effects of teaching mathematics using the home language in the Foundation Phase. Multilingual countries like South Africa have recently focused on using home language to teach mathematics during the Foundation Phase. When taught in a second or third language, learners typically struggle with mathematics. This research review analyses how home language in mathematics education improves learners' knowledge, engagement, and performance. Growing evidence shows that utilising a familiar language in teaching enhances understanding and long-term academic achievement due to cognitive and emotional advantages. This section will use research to show how home language education improves math comprehension, fosters good learning experiences, and addresses multilingual learning problems.

Scholars like Cummins (2020) argue that bilingualism should be used in education to address knowledge gaps. Ngcobo and Mlambo (2021) further note that Indigenous languages in early mathematics instruction assist learners to relate abstract mathematical concepts to real-world experiences. Educational policy, teacher training, and curriculum development must be aligned for home language teaching to succeed. Zhou, Li, and Han (2022) stress that without a comprehensive strategy and strong legislative support, language-related hurdles might impair academic growth. This study critiques previous studies on home language and mathematics education and suggests future research and policy changes.

Using home language reduces cognitive overload and creates a more inclusive learning environment, especially for underprivileged learners (Probyn, Govender & Hlongwane, 2022). Although, transitioning from home language instruction to English as the language of learning and teaching (LoLT) in later grades remains difficult. The debate will examine the pros and cons of this instructional method, using current literature to offer context. This review contributes to arguments on the best use of home language in education, focussing on South Africa.

2.2. THEORETICAL FRAMEWORK

This study adopted Lev Vygotsky's Sociocultural Theory, which emphasizes the importance of social interaction and language in learning. Language is an important

part of brain growth because it affects how learners think about and solve mathematics problems, especially in the Foundation Phase. Vygotsky's sociocultural theory says that people learn things from each other and that language is the main way we communicate cognitive processes (Vygotsky, 1978). This point of view emphasizes that for young learners, learning mathematics in their home language helps them understand it better because the language makes the connections and thought processes easier. In places where people speak more than one language, learning mathematics in a home language can get rid of language hurdles and help people solve problems better (Cummins, 2020).

The social theory, which was emphasised by Setati and Dlamini (2021), fits with the idea that people learn mathematics by interacting and taking part in situations that are important to their culture. Mathematics lessons are more important in schools where learners are taught in their own language because they are connected to the learners' cultures. Language is not just a way to learn; it is also a way to connect abstract mathematical ideas to things that people do every day (Ngcobo & Mlambo, 2021). By letting learners make connections between what they are learning in school and what they have experienced in real life, teaching mathematics in the home language encourages group learning and increases outcomes and overall interest.

The linguistic dependency theory by Cummins (2020) is another important concept. It shows that being good at a learner's home language can help them learn other languages and academic skills, like mathematics. When people are skilled in their first language, they can use those thinking skills to understand difficult ideas in a second language, which makes them better at working with people who speak more than one language (Heugh, 2020). This suggests that early achievement in the home language might aid with school success later when the emphasis changes to English.

The Sapir-Whorf hypothesis, which is sometimes termed the theory of linguistic relativity, also helps us comprehend how language influences our ideas and understanding (Heugh, 2020). This theory states that syntax and vocabulary shape a speaker's worldview. Languages with differing number representations or math-only terminology may alter how learners grasp and utilise math ideas. Zhou, Li, and Han (2022) discovered that bilingual learners who used both the teaching language and their home language performed better on arithmetic tasks. This supports the

assumption that home language reduces cognitive burden and helps learners learn abstract mathematical concepts with ease and understanding.

The Zone of Proximal Development (ZPD) in Vygotsky's theory states that kids learn best when they have Teachers and peers that scaffold them. This kind of help works best in bilingual classes when it's given in the learner's home language, which makes it easier to understand what's being said and why. Ngcobo and Mlambo (2021) aver that learners may not be able to reach their full potential in the ZPD if they don't get help with their language at home. This is because they would have to deal with both verbal and mental problems at the same time.

Some researchers warn against relying too much on home language teaching, saying that it might keep learners from hearing the main language used in college and the workplace (Probyn, Govender & Hlongwane, 2022). They say that teaching a child a language at home is good for building basic skills, but that learners need a well-rounded bilingual education to be ready for future difficulties in school and the workplace. So, the task is to find a way to teach that helps learners get better at both their home language and other languages without hurting their ability to understand mathematics.

These academic points of view show that language is not only a way to communicate but also an important part of learning mathematics. Using home language in mathematics class helps learners understand concepts better, gets them involved and improves their ability to solve problems. These effects are especially clear in the Foundation Phase, when learners are learning the thinking skills, they will need in later stages. Teachers need to understand how important it is to teach languages at home and use teaching methods that take advantage of different language groups to help learners learn more. The key is to make a welcoming space where learners can use their home language as a guide while slowly learning other languages that will help them do well in international educational settings.

2.3. EMPIRICAL LITERATURE

Robertson and Graven (2020) state that empirical literature refers to studies or research findings that are based on observed and measured phenomena. These

studies involve the collection of data through various methods such as experiments, surveys, case studies, observations, or other forms of direct measurement and analysis. This potion will get too deep into the research findings on the effect of teaching mathematics using home language instruction.

2.3.1. BENEFITS OF HOME LANGUAGE INSTRUCTION IN MATHEMATICS

Home language training during the Foundation Phase improves math comprehension via cognitive, emotional, and pedagogical effects. This method helps learners understand mathematical ideas by using their own language and culture (Heugh, 2020). Setati and Dlamini (2021) claim that home language decreases cognitive burden, allowing learners to focus on mathematics rather than language. Learners confidently participate in problem-solving and class debates, improving learning outcomes (Zhou, Li & Han, 2022).

A major benefit of home language training is its ability to connect daily English with formal mathematical terms. Moschkovich and Planas (2020) suggest that teaching mathematics in a familiar language helps learners link it to real-life situations, making it more engaging. Learners gain conceptual comprehension and mathematics confidence from this smooth transition from casual to formal knowledge. Ngcobo and Mlambo (2021) agree that linking abstract mathematical ideas to cultural settings motivates learners to engage actively and boosts mathematics interest.

Since home language training builds on previous knowledge, cognitive advantages are also considerable. Cummins (2020) emphasises the "transfer of knowledge," indicating that first-language learners may apply cognitive abilities to mathematics. This transfer increases mathematics understanding and thinking. Zhou et al. (2022) found that bilingual learners perform better in mathematics when taught in their native language. By employing familiar linguistic patterns, learners become competent at solving complicated issues.

Home language learning has benefits for more than just your brain. Heugh (2020) says that teaching mathematics in the home language makes learners less anxious and unhappy with their second language. Learners feel better about themselves and are more motivated when they are good at language arts and mathematics. This method also helps learners feel more connected to their language and culture. Ngcobo and

Mlambo (2021) say that recognising learners' local languages in the classroom makes them more interested and motivated to learn mathematics.

Research shows that learning a language at home does work. Probyn, Govender, and Hlongwane (2022) discovered that South African learners better understood and handled mathematics problems when they learned it in their own language. The study showed that learners who learned mathematics in their own language were more interested and did better, which shows how important it is to teach in a way that takes culture into account. Zhou et al., (2022) showed that learning a language with your family as a child sets them up for success in school.

One big benefit of home language training is that it can help learners do better in school over time. Cummins (2020) says that learners learn basic ideas better when they start school in their own language, which gets them ready for more learning. This base helps kids make a smooth move to middle school, where language classes may change. Also, Zhou et al., (2022) say that learning a language at home improves academic confidence and brain growth when you're not in school.

Even though home language training has been shown to be helpful, some studies say that it shouldn't be used as the only method. Probyn et al. (2022) say that learners need to learn the common language used in higher education and the workplace, even though learning a language at home can help with basic skills. A balanced bilingual education plan that uses both home language and second language to give kids the language skills they need for success in school and the workplace is supported by this method.

In general, teaching mathematics in a child's home language helps their knowledge, interest, and ability to think. By letting learners talk about math ideas in everyday words, this approach gets rid of brain hurdles, boosts confidence, and raises academic success. Cummins (2020) and Ngcobo and Mlambo (2021) both talk about how culturally and language-relevant education can help learners' mental and emotional health. Because of these benefits, learning a language at home is necessary for bilingual mathematics education and ensures success in school and in daily life.

2.3.2. CHALLENGES OF IMPLEMENTING HOME LANGUAGE INSTRUCTION

2.3.2.1. Transition from Home Language to English in Higher Grades (Grade 4 Onwards)

In bilingual schools, the switch from home language to English as the major language at Grade 4 is difficult. This change makes it harder for learners to keep up with their language use in the Foundation Phase, where their home language is used most of the time. Heugh (2020) says that when learners go from using a language they are used to having to learn math ideas in a language they are not as familiar with, it can cause brain stress, which can negatively affect their success in school. Using too much English can make it harder to understand, especially in courses like mathematics, where it's important to understand vague ideas. Probyn et al., (2022) stress that learners often find it hard to engage with mathematics in a meaningful way when their English language skills aren't good enough. This means that there is a gap between what they understand mathematically and what they can say about it in the language of instruction.

This change in language puts pressure on learners who are learning because they must improve both their language skills and their subject-specific skills at the same time. Setati and Dlamini (2021) stress that this language barrier not only lowers learners' academic performance but also makes them less confident and less likely to engage in class talks. Zhou et al., (2022) found that learners who are taught in their home language in the early years are better able to understand and remember abstract mathematical ideas. On the other hand, when English is used as the language of teaching, they are less able to explain their thinking and solve problems. This makes their performance worse by the time they are in Grade 4.

The Department of Education (2020) talks about how important it is to provide support during this time of change. They say that teaching English at home at the same time may help with some of these problems. Nevertheless, this method is not used often because teachers do not get enough training, and resources are not always available, making the transition problems worse (Ngcobo & Mlambo, 2021). As a result, intermediate language policies are still controversial, with some saying that the current approaches do not do enough to meet learners' cognitive and verbal needs.

2.3.2.2. Linguistic and Cultural Barriers to Teaching Abstract Mathematical Concepts

Teaching abstract mathematics in a learner's home language both helps and hinders comprehension. Language variety makes communicating complicated concepts difficult in multilingual classrooms. According to Moschkovich and Planas (2021), learners struggle with mathematical jargon, which is not always simply translated into indigenous languages. Cultural disparities in mathematics comprehension and application exacerbate this difficulty. In some African languages, the idea of zero or negative numbers may not have a clear equivalent, which makes it hard for teachers to explain them in home language lessons. Heugh (2020) says that learners may get complex ideas wrong when they try to use them in everyday words because of language barriers.

Indigenous languages are used to teach mathematics to make it easier for people to learn, but the fact that they can't fully explain mathematical ideas makes it very hard to do. Probyn et al., (2022) say that because their learners come from a lot of different home languages, South African teachers have a hard time finding the right words to use when talking about abstract ideas like math reasoning, geometry, and chance. Because of this language gap, learners might understand the basics but not be able to make deeper mental links.

Even with these problems, using home languages when learning mathematics early on has been shown to improve brain function. Vygotsky's social theory from 1978 says that people learn better when they use their own language. Culture can affect how people are taught and how well they learn, especially when it comes to mathematics. Ngcobo and Mlambo (2021) found that using local examples and native ways of counting in mathematics class helped learners make connections between abstract ideas and their own lives. These benefits might not be worth it if teaching difficult mathematics ideas in first languages is hard without the right tools and training for teachers.

2.3.2.3. Teacher Preparedness and Training in Multilingual Pedagogy

One of the main challenges of home language mathematics education is training Teachers. Successful bilingual education requires teachers to teach and manage

several languages. Many Teachers lack the abilities and training to achieve this. Setati and Dlamini (2021) state that South African teachers get little multilingual training. This makes teaching mathematics in home tongues difficult. Teachers lack professional development in this area; therefore, they're unprepared for language hurdles in multilingual classrooms. Therefore, they switch languages or return to English too frequently, defeating the objective of home language training.

Moschkovich and Planas (2021) found that Teachers' language proficiency affects learners' performance. Most Teachers do not speak their learners' home languages, making teaching difficult. Since Teachers may struggle to convey complex mathematical concepts in a clear and coherent manner, this language barrier makes teaching and learning tougher. Probyn et al., (2022) also note that the lack of multilingual resources and tools exacerbates the issue. Teachers must find their own approaches to handling language differences in the classroom.

Many programs educate teachers on how to teach in many languages to address these issues. Some teacher-training programs now teach mathematics in home languages and two languages, according to Ngcobo and Mlambo (2021). But these programs do not always have enough money and does not reach enough teachers to make a big difference. Ongoing professional development is also needed to ensure that teachers know about the newest ways to teach and the tools available for teaching in more than one language (Cummins, 2020). The problems with teaching mathematics to learners who speak more than one language are likely to stay if we do not keep training and supporting teachers. This will make home language learning in the Foundation Phase less useful.

In order for home language teaching in mathematics to work, the research shows that teachers need to be better trained and more ready. Zhou et al., (2022) say that teachers need to know a lot about how language affects brain growth and learning results and be able to speak more than one language well. It is possible to improve the quality of mathematics teaching and help learners as they move from speaking their home language to English in higher grades by filling in the holes in teacher training and giving multilingual education more resources.

2.3.3. CODE-SWITCHING AS A PEDAGOGICAL STRATEGY

2..3.3.1. Definition and Role of Code-Switching in Mathematics Classrooms

Code-switching is crucial in bilingual mathematics classes. Teachers utilise it to overcome language barriers and improve learners' understanding. Setati and Dlamini (2021) say that teachers can better explain difficult mathematical ideas if they can break them down into words that learners can understand. Learners can learn more and be more accepting of others by interacting with information in a different language. Cummins (2020) claims that code-switching empowers kids to switch languages and improve cognitive flexibility.

Code-switching in schools goes beyond translation. Teaching using it improves learners' involvement and interaction. Alternating languages helps Teachers engage language-challenged learners, according to Moschkovich and Planas (2021). Code-switching helps Teachers develop culturally sensitive classrooms that honour learners' linguistic identities. Teachers who validate learners' native languages promote a feeling of belonging, which improves learning, according to Probyn et al., (2022). This method bridges languages and promotes justice in multilingual education

2..3.3.2. Benefits and Limitations of Code-Switching in Multilingual Settings

Code-switching is a great way to help kids understand and get them interested in mathematics class. Ngcobo and Mlambo (2021) say that learners often have trouble understanding abstract math ideas when they are only taught in English. By using words that learners already know, teachers make these ideas easier to understand so that learners can connect them to things that happen in their daily lives. Learners are more likely to be interested in learning when they can say what they want to say in the language they know best. This practice gets more learners involved because they are more likely to speak up in class when they do not have to worry about language hurdles (Probyn et al., 2022).

Even though code-switching has some benefits, it also has some problems. One big problem is that learners might get brain stress because they have to move between languages, which could make them confused and make it harder for them to understand math ideas (Zhou et al., 2022). Also, the different ways that words are

used in different languages can cause confusion, especially when it comes to topics like mathematics, where accuracy is very important. Setati and Dlamini (2021) warn that teachers need to be careful with code-switching not to reinforce wrong ideas about mathematics. There is also the chance that home languages will be looked down upon if they are seen as less formal than English. This could go against the goal of supporting linguistic equality (Heugh, 2020).

These limits must be carefully thought through in order for code-switching to work. Teachers need to find ways to use more than one language in the classroom without lowering the level of the lessons. According to Cummins (2020), professional development programs for teachers should focus on giving them the skills they need to use code-switching well. By doing this, teachers can get the most out of this method of teaching while also minimising its possible problems.

2..3.3.3. Teacher Competencies in Managing Code-Switching for Effective Learning

Teachers need linguistic, pedagogical, and cultural understanding to handle code-switching in mathematics courses. According to Setati and Dlamini (2021), Teachers who are fluent in both the language of instruction and learners' native languages are better able to enable meaningful learning. Teachers may easily swap languages to precisely and successfully explain mathematical topics. Ngcobo and Mlambo (2021) add that Teachers must be proficient at code-switching at the right times to avoid confusing learners and disrupting education.

Teachers need code-switching pedagogy as well as language abilities. To employ code-switching successfully, Probyn et al., (2022) say Teachers must comprehend bilingual education's cognitive and linguistic demands. Teachers may learn how to use multilingual pedagogy to improve learning in professional development programs. Cummins (2020) recommends classroom simulations to help Teachers practise code-switching in real time.

Cultural competency is also essential for code-switching management. Moschkovich and Planas (2021) advise Teachers to employ code-switching and be attentive to learners' cultures to build inclusive learning environments. This requires

acknowledging learners' native languages' cultural values and using culturally appropriate examples in mathematics training. Culturally competent teachers are more likely to build strong learner interactions, which is necessary for a helpful learning environment. Multilingual mathematics Teachers must master code-switching. Zhou et al., (2022) stress that teacher training programs must prioritise these abilities to prepare Teachers for bilingual education's linguistic difficulties. Schools may build learning settings that maximise code-switching's advantages while minimising its drawbacks.

2.4. PEDAGOGICAL BARRIERS TO HOME LANGUAGE INSTRUCTION

2.4.1. Systemic Challenges in Resource Allocation and Curriculum Design

There are major structural problems with putting home language teaching in mathematics into action, especially when it comes to allocating resources and making lessons. South African schools do not have the same funding, making it harder to use home language teaching successfully (Probyn, Govender & Hlongwane, 2022). It is common for urban schools to get more money and better teaching materials than country schools. This means that home language mathematics education isn't always provided equally (Setati & Dlamini, 2021). These problems are made worse by a national program that supports using the home language in the foundation phase but isn't flexible enough to work in a variety of language settings. According to Heugh (2020), home language teaching is not very useful because the content isn't always in line with what people need in the local language. This means that teachers often have to switch back to English to make things clearer.

Also, it is hard for curriculum writers to ensure that math material is the same across different languages, making home language teaching less organised. Ngcobo and Mlambo (2021) say that attempts to match the curriculum with indigenous languages are harder because these languages do not have enough technical mathematical words. This makes it hard to teach in a consistent way. Zhou, Li, and Han (2022) say that if the curriculum isn't changed properly, it could turn off learners who are meant to benefit from learning the language at home, which goes against the goal of linguistic inclusion. To fix these structural problems, the government must keep spending

money on making resources and hiring teachers. This will make sure that educational rules are followed in the classroom.

2.4.2. Lack of Mathematics Teaching Materials in Home Languages

A lack of effective indigenous language teaching resources hinders home language mathematics education. Many South African schools use English-based textbooks and additional materials, which are restricted and do not address language diversity (Bowie et al., 2022). Without proper tools, Teachers must interpret mathematical information on the fly, which may lead to mistakes and poor learners' understanding, according to Ngcobo and Mlambo (2021). Probyn et al., (2022) also note that indigenous languages lack standardised terminology, making it difficult to provide consistent teaching materials and hindering multilingual education.

Localised solutions like community-led textbook translation have attempted to bridge this gap. Due to finance and government support issues, these endeavours generally fail (Setati & Dlamini, 2021). Zhou et al., (2022) note that fragmented initiatives to build home language resources cannot retain effect without a centralised plan. Educational institutions, government organisations, and local communities must work together to provide high-quality, culturally appropriate mathematical resources in native languages. This strategy will encourage learning and recognise learners' linguistic identities, creating a more inclusive educational environment.

2.4.3. Teacher Attitudes and Resistance to Home Language Instruction

How teachers feel about home language education is very important to how it works, and there are many reasons why some teachers do not want to do it. Setati and Dlamini (2021) say that many teachers think English is the best language for school, which makes them hesitant to use home language teaching even though the policy requires them to. People often do not want to teach English because they think that learning it early will help learners do better in school, especially in topics like mathematics that are seen as having a world focus (Ngcobo & Mlambo, 2021). Heugh (2020) says that this way of thinking comes from a deep-seated linguistic order, where native languages are seen as less important for official schooling. This keeps the circle of injustice going.

Teachers do not want to change because they do not trust themselves to teach mathematics in native languages. According to Zhou et al., (2022), a lot of teachers don't have the language and teaching skills to successfully use home languages in their lessons, which makes English education more popular. Probyn et al., (2022) also say that professional development programs that focus on language teaching aren't always good enough, leaving teachers unable to handle the challenges of bilingual education. To deal with these attitude problems, teachers need specific professional development that not only improves their language skills but also changes how they see home languages as useful teaching tools

2.5. BEST PRACTICES FOR HOME LANGUAGE-CENTERED MATHEMATICS INSTRUCTION

2.5.1. Effective Teaching Strategies for Using Home Languages in Mathematics

Home language education in mathematics demands effective teaching methods to maximise learners' understanding and involvement. Translanguaging, when Teachers alternate between the home language and instruction language, promotes conceptual comprehension in multilingual environments (Moschkovich & Planas, 2021; Ngcobo & Mlambo, 2021). Building on past language knowledge reduces cognitive stress and makes mathematical topics more approachable for learners. Probyn, Govender, and Hlongwane (2022) emphasise the benefits of co-teaching when native-language and English-speaking Teachers teach together. This fosters linguistic diversity and provides excellent bilingual education.

Culturally responsive education, which adapts to learners' cultures and languages, is also beneficial (Cummins, 2020). Educational institutions may improve learners' engagement and math attitude by incorporating known cultural components into mathematical examples and problems. Setati and Dlamini (2021) found that local settings in educational materials motivate and engage learners. According to Zhou, Li, and Han (2022), learners perform better when mathematical information is applied to real-life situations. These methods make arithmetic home language training accessible and relevant.

2.5.2. Integrating Cultural Relevance in Mathematics Teaching

Including culturally relevant mathematics in the classroom is important for keeping learners interested and helping them do well in school. Another way to make mathematics more culturally relevant is to include local knowledge systems in the lessons. Ngcobo and Mlambo (2021) recommend teaching Indigenous math skills like counting and problem-solving in school to help learners apply what they learn in school to real life. According to Moschkovich and Planas (2021), culturally situated mathematics questions based on local economic activities like farming or trading should be incorporated to make them more relevant and practical.

Storytelling is another culturally relevant strategy that helps kids grasp numbers. Bowie et al. (2022) found that narrative-based instruction may assist learners in answering mathematics problems by using personal tales. Rural places, where tales are spoken aloud, benefit most from this method. Probyn et al., (2022) found that telling arithmetic tales helps learners relate abstract concepts to real-world events, improving comprehension and memory.

Involving parents and community members in arithmetic instruction may also emphasise cultural importance. Zhou et al., (2022) recommend that schools cooperate with local organisations to provide culturally appropriate materials. This collaboration enhances the curriculum and gives learners a feeling of control, motivating them to perform well in arithmetic. Teachers may make the classroom more friendly and helpful by making mathematical teachings relevant to each learner's culture.

2.5.3. Examples of Successful Implementation in South African and Global Contexts

Several good programs show how language learning at home can help learners do better in school. Funda Wande has helped foundation-phase learners in Limpopo province do better in mathematics (Makaluza & Mpeta, 2022). Local language teaching helpers help teach math in English and the learners' first language as part of this program. The method has made learners more interested in learning and helped them do better. For example, in just one year, Grade 1 learners got better at mathematics.

Bolivia teaches mathematics to kids in early grades in their own languages (Heugh, 2020). Traditional ways of measuring and counting are taught as part of the syllabus to encourage ethnic pride and interest in mathematics. Zhou et al., (2022) found that learners who go to bilingual schools do better on regular math tests than their classmates. A good method used in Bolivia shows how important it is to include language and culture when teaching mathematics.

For example, the Matematik-Mål project in Sweden uses translanguaging to help children who speak more than one language learn math better (Moschkovich & Planas, 2021). Teachers learn how to use Swedish and their learners' home languages in the classroom through training in mixed teaching methods. The program has shown that bilingual mathematics learners solve problems better than monolingual learners. These examples demonstrate how home language-centered teaching may increase learners' achievement and educational equality.

2.4. CRITIQUE OF LITERATURE

2.5.1. Implications of Home Language Instruction for Educational Policy

2.5.1.1. Alignment with South African Education Policies on Language and Learning

South Africa's Language-in-Education Policy (DoE, 1997) supports using learners' home languages in the early stages of schooling. This supports the idea that teaching a child a language at home can help them learn. The Curriculum and Assessment Policy Statement (CAPS) from the Department of Basic Education (Department of Basic Education, 2011) also supports this policy. It says that teaching in indigenous languages is okay during the base phase. By supporting home language teaching for mathematics education, the CAPS framework hopes to improve learners' ability to understand and participate. However, there are still operational gaps, as Essien and Sapire (2022) pointed out, saying that many schools have trouble because they don't have enough tools or trained teachers who can teach mathematics in two languages.

There is evidence that home language teaching and school policy goals can work together. Heugh (2020) says that teaching in a mother tongue is in line with the ideals of sustainable development goal because it encourages all learners to get an equal education. Additionally, Probyn et al., (2022) stress that teaching mathematics in

native languages improves the level of knowledge among learners. But Cummins (2020) asserts that policies that encourage teaching a language at home need strong support systems, such as training for teachers and new lessons. Even though there are policy frameworks in place, they are not always followed in practice. This means that specific changes are needed to fix the problems between policy and practice.

2.5.1.2. Potential Impact on Learner Performance and Long-Term Academic Success

Home language training greatly affects learners' performance and academic growth. Moschkovich and Planas (2021) discovered that learners taught mathematics in their home language had superior problem-solving and conceptual comprehension than those taught in English. The lower cognitive effort of digesting material in a familiar language improves understanding. Ngcobo and Mlambo (2021) also found that culturally and linguistically relevant mathematics training increases learners' involvement. Thus, learners are more likely to like mathematics, boosting academic performance.

Zhou et al., (2022) found that bilingual education learners fared better on standardised arithmetic tests. The Funda Wande program in South Africa found that Grade 1 learners who learned in their home languages improved their mathematics abilities (Makaluza & Mpeta, 2022). These findings suggest home language instruction may enhance schooling and reduce performance gaps. Later grades' switch from home language instruction to English as the language of learning and teaching (LoLT) may impair academic advancement. Policy frameworks must address language education continuity to preserve academic performance beyond the foundation.

2.6. SUMMARY

2.6.1. Recommendations for Policy Reform and Future Research

Policy needs to change so that teaching a language at home can fully help with mathematics education. The rules about language use in schools need to be changed so that there are no more problems with management and all the schools have the tools they need. According to Probyn et al., (2022), more money should be put into programs that train teachers to teach in two languages. This way, teachers will be able

to teach mathematics with confidence in both English and native languages. Heugh (2020) also stresses how important it is for Teachers, lawmakers, and community members to work together to create a program that fits the ethnic backgrounds of all learners.

In the future, researchers should look into how home language teaching affects academic success after the base phase. Zhou et al. (2022) postulate that it is important to know how bilingual teaching affects academic success and brain growth over time to make good policy. More research should also be done on how to make the change from learning English at home to learning English in higher schools go smoothly. Ngcobo and Mlambo (2021) support the creation of transfer models that help learners keep up their language and mathematics skills as they move through the school system. Additionally, comparing studies from different international settings can help us understand the best ways to include home language teaching in mathematics lessons.

2.7. CONCLUSION

This chapter focused on a literature review that highlights the significant benefits and challenges of using home language in teaching mathematics, particularly in the Foundation Phase. Teaching in a learner's home language enhances comprehension, cognitive development, and academic performance by connecting abstract mathematical concepts to real-life experiences. This chapter emphasized the theoretical framework adopted in this study by Lev Vygotsky's "The Sociocultural Theory" and supports theories by Cummins' Linguistic Interdependence theory that underscore the role of language in shaping cognitive learning processes. While home language instruction promotes engagement and reduces cognitive overload, challenges arise when transitioning to English in higher grades, requiring balanced bilingual education.

The chapter further explains how home language instruction is crucial for young learners. To maximize its benefits, educational policies, teacher training, and curriculum development must support multilingual education and ensure smoother transitions to English. Effective bilingual education requires overcoming gaps in teacher preparedness, resources, and the availability of home language materials.

In conclusion, this chapter explained best practices for home language-centered mathematics instruction where effective teaching strategies for Using Home Languages in Mathematics home language-centered strategies, including code-switching, were described as they can enhance mathematics learning by bridging language barriers and making abstract concepts more accessible. However, overcoming systemic challenges, such as limited resources and teacher training, is essential. Collaboration between educational institutions, communities, and policymakers is needed to create an equitable multilingual educational environment. Research into long-term effects and strategies for smooth language transitions will further strengthen the impact of home language instruction. The next chapter will look into the research methodology, paradigm, data collection, population, and sampling procedure this study will adopt.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. INTRODUCTION

This chapter outlines the research approach used to explore Foundation Phase home language mathematics education in Sibasa Circuit, Vhembe East District, Limpopo Province. The study evaluated how home language mathematics instruction affects teaching, learning, and educational practices. The qualitative study used Lev Vygotsky's Sociocultural Theory, which emphasises social and cultural influences on cognition. This approach emphasises language's mediation of learning, making it suited for home language mathematical instruction.

Qualitative research analysed complicated and context-specific phenomena to understand teachers' and learners' home language instruction. The chapter covers the study paradigm, design, technique, data collecting, sample, analysis, limitations, trustworthiness, and ethics. The methodology was designed to generate large, contextually relevant study data.

Vygotsky studied how language affects young children's math comprehension. Bell et al. (2022) and Reyes et al., (2021) recommend qualitative methods for studying educational practices because they allow researchers to connect with participants' living experiences actively. Qualitative research's thematic analysis may reveal teaching and learning dynamics, say Naeem et al., (2024). This chapter outlines the data collection, analysis, and evaluation techniques for this study.

The study placed the research in the Sibasa Circuit's social and linguistic context to enlighten teachers and policymakers. Qualitative methods have been shown to capture the intricacies of educational practices in linguistically heterogeneous settings by Hossain et al., (2024) and Mannheimer (2024). Based on this foundation, this chapter describes methodological rigour, including data credibility and ethical considerations.

This chapter provides a guide through the study's methodology. The next sections describe the research paradigm, design, data collecting, and analysis methods, highlighting the study's qualitative nature. The methods acknowledge the intricacies of language use in mathematics instruction and express a commitment to addressing the

research concerns. The extensive details attempt to make the study transparent and replicable, providing a solid foundation for comparable studies.

3.2 RESEARCH PARADIGM

This study wanted to fully understand how effective or not it is to teach mathematics in real-life situations using the home language. In qualitative study (Bell et al., 2022), researchers can understand what people are saying if they focus on their life experiences. The main goal for this study was to find out how home language changes teaching and learning in FP mathematics classes. This paradigm fits that role well.

The study was based on the constructivist view, which says people learn through interacting with others. Sociocultural Theory by Vygotsky laid the groundwork by showing how culture, language, and cognitive development are all linked. We can study how cultural tools, such as language, affect how we learn, according to Fife and Gossner (2024). This is because constructivist theories let us do just that. The main point of the study was to find out how to teach mathematics in a place where a lot of people speak different languages. This point of view fits with that.

With the qualitative method, we could learn more about how teachers, learners, and other people who had a stake in the use of home language in mathematics lessons felt about it. Some researchers, such as Reyes et al., (2021) and Dang et al., (2024), say that qualitative methods can help them understand how schools work in ways that quantitative methods might miss. This can be a lot of useful information from the model for this study, which showed the good and bad things about teaching a language at home.

The qualitative model was chosen since it is flexible and lets the researcher look at how things are in the Sibasa Circuit. It also fits the study's goals. Naeem et al., (2024) say that qualitative research is best for studying things that happen in certain cultural and social settings since it puts the views of participants ahead of ideas that are already thought. It was very helpful to be able to adapt in order to understand the many ways that home language education can change how people teach and learn.

The constructivist model also helped people find themes and patterns like things they had been through in their lives. A big part of qualitative study is thematic analysis,

which Hameed (2024) says is a great way to discover how teaching methods work. Interviews, focus groups, and classroom observations were used along with thematic analysis to ensure that the study's results were based on what the people who took part thought.

Since it used a qualitative approach, the study added to the growing body of research on language and education. The study has put some insights on the bigger effects of home language teaching in mathematics with the help of the paradigm. It also helped the researcher with the study questions. It fits with what researchers like Modugno (2024) agree should be done to solve tough problems in education. This in-depth look at the research paradigm makes it clear how it fits into the study and sets the stage for the sections that follow, which are about research design and methods.

3.3 RESEARCH DESIGN

Research on home language mathematics instruction in FP classrooms employed case studies. This study adopted case study method since it improves understanding of a phenomenon in its natural surroundings (Bell et al., 2022). Case studies help educational scholars understand how diverse factors affect teaching and learning (Naeem et al., 2024). The case study design enables this study to explore the Sibasa Circuit and its unique home language mathematics training dynamics.

The case study design lets researchers collect data from teacher interviews, parent focus groups, and classroom observations. Data triangulation provided a thorough view of the topic, improving trust (Dang et al., 2024). Case study research's triangulation strength lets researchers validate findings from several viewpoints, according to Reyes et al., (2021). Triangulation strengthened this study's findings and represented participants' experiences.

The case study placed emphasis on the Sibasa Circuit. Modugno (2024) suggests using case studies to explore phenomena in distinct cultural and social situations to account for local features. The case study design explained how regional linguistic and cultural variables affected home language use in mathematics instruction.

Teachers', parents', curriculum advisors', and school departmental heads' responsibilities were analysed using the case study technique. Pham (2024) says case

studies collect diverse data to capture stakeholders' perspectives. The study involved multiple stakeholders to comprehensively assess home language mathematics instruction challenges and opportunities.

The case study design allows the researchers to enter persons' lives and capture their interactions and thoughts. Tomás and Bidet (2023) recommend case studies for examining complex educational issues since they allow researchers to analyse teaching and learning processes. The case study approach describes home language training's effects on mathematical cognition and outcomes in detail.

The case study gave Teachers and policymakers actionable insights. The method permitted research and examined home language mathematics training's wider effects. The thorough description of the research design highlights its relevance and applicability to the study, including data collection and analysis methods.

3.4 METHODOLOGY

A qualitative study method was used since it was able to really look into the tricky and situational parts of teaching mathematics in the home language in FP schools. Qualitative study focuses on keeping records of the participants' thoughts, feelings, and experiences. This helps researchers understand things better than when they only use quantitative tools (Bell et al., 2022). This method worked well for this study since it let the researcher look at how learning a language at home changed how mathematics was taught and learned. Sociocultural theories, like Vygotsky's Sociocultural Theory, also agree with the qualitative method. For example, Dang et al., (2024) say that language plays a key part in cognitive development. The research method looked into the participants' complicated situations and the factors that affected them (Fife & Gossner, 2024). This helped the researchers learn a lot about the subject. As Naeem et al. (2024) say, this is very important in the study of education since personal experiences and sociocultural factors are often linked.

Since the study was qualitative, the research process was also open enough to fit the needs of the Sibasa Circuit, a school where a lot of different languages are spoken. Hossain et al., (2024) say that the best way to deal with the difficult ways that culture and language affect education is to use qualitative methods. The researcher got to know the subjects better through this method, according to Modugno (2024). This led

to the collection of useful data showing how teaching and learning work in that setting. The qualitative methods used in the study not only added to what was already known in the field but also helped teachers and policymakers who work on related issues.

3.5 DATA COLLECTION

Understanding the research problem was achieved through triangulated data collection. Data triangulation and diverse approaches boost study trustworthiness (Bell et al., 2022). This study achieved its goals through semi-structured interviews, classroom observations, and document analysis.

3.5.1. Interviews

Conversations with curriculum advisors, teachers, and parents that were only loosely planned were the main way data was gathered. So, Dang et al. (2024) say the researcher could really find out what the people who took part thought about using their own language to teach mathematics. People were able to talk more deeply about their thoughts and feelings because of how the interviews were set up. Every talk was listened to, typed up word-for-word, and then analysed by topic to make sure all the details were seen (Hossain et al., 2022). Fife and Gossner (2024) say that semi-structured conversations are best for qualitative studies since they assist in exploring new ideas while still giving them a way to follow the rules. Patterns and differences in their comments were looked for to get a full picture of what the people who took part thought about home language learning.

3.5.2. Classroom Observations

Mathematics classes incorporate home language education, according to classroom observations. The researcher observed teacher-learner interactions, pedagogical techniques, and classroom dynamics (Naeem et al., 2024). The researcher could contextualise interview results and evaluate theoretical perspectives. Mannheimer (2024) says observations strengthen qualitative research by documenting real-time behaviours and interactions. This study studied how teachers explained mathematics in the home language, learners' engagement, and learning environment. The findings helped the study understand the practical practicality of the Foundation Phase of home language instruction.

3.5.3. Document Analysis

Along with talking to people and observing, looking at documents helped us learn more about the rules and institutions that control teaching languages at home. Pham (2024) says that the researcher looked at policy papers, lesson plans, and curriculum guides to find out the rules and instructions for teaching mathematics in the home language. By taking a comprehensive view, the researcher was able to identify areas where theory and practice diverged. According to Reyes et al., (2021), document analysis is crucial to qualitative research since it demonstrates how social circumstances influence people's actions. The outcomes of document analysis were combined with information from observations and talks to provide a comprehensive picture of the study problem.

The study combined all three techniques to ensure a robust and comprehensive data collection process. Because of this, the results were more accurate, and the experts had a wealth of material to work with, which enabled them to provide thoughtful answers to their queries.

3.6 SAMPLING

3.6.1 Population

As research methodology scholars outline, the population represents the entire group of individuals or units of analysis which form the focus of the research study, (Ahmad, Alias & Razak, 2023). Population parameters generally align with the problem statement and objectives framing the inquiry. This study involved mathematics teachers from the Foundation Phase, the head of the department, curriculum advisors, and parents from the Sibasa Circuit in the Vhembe East District of Limpopo Province. According to Dang et al. (2024), intentional sampling is commonly used to identify participants with the necessary skills and experience.

3.6.2 Sample

Sample refers to a smaller group or subset of individuals, items, or observations selected from a larger population for the purpose of conducting a study, (Edward,2020). The sample is used because it is often impractical or impossible to

study the entire population. Researchers can make inferences or generalizations about the larger population by studying the sample. The sample included 32 participants: 10 mathematics teachers from grades R–3, 15 parents, 5 school department heads, and 2 curriculum advisors. Mathematics teachers were selected from grades R–3 to ensure their input was grounded in practical, real-life teaching experiences (Fife & Gossner, 2022). Parents offered valuable insights into how teaching their children in their home language influenced their learning and engagement with mathematics. Multi-stakeholder educational studies, as noted by Modugno (2024), help to confirm and extend existing knowledge.

Naeem et al. (2024) suggest that head teachers and district education officers contribute important institutional and policy information regarding home language instruction. Participants also linked their classroom experiences to broader educational systems and policies. Hossain et al. (2024) stress the importance of ensuring that the sample is diverse enough to capture various perspectives in qualitative research. The sampling process in this study examined the problem from multiple levels, including classroom practices and institutional outcomes. The diversified and purposeful selection of participants led to meaningful and relevant findings.

3.6.3 Sampling Procedure

According to Edward (2020), the sampling procedure refers to selecting a subset (sample) from a larger population to participate in the study. This subset should represent the population in such a way that the findings can be generalized to the entire population. The researcher observed how learners and teachers interact during mathematics lessons, with particular attention to how ideas are shared and instructional strategies are implemented. Non-participative classroom observations focus on learner and teacher activities during home language-based mathematics lessons. Detailed observational field notes document learner interactions—such as participation patterns, peer collaboration, and vocabulary reinforcement—and the instructional techniques teachers employ. These included code-switching practices, the use of multilingual learning aids, and the real-life contextualisation of mathematical concepts. By observing both learners and teachers, the study illuminated the opportunities and challenges associated with using home language in mathematics

instruction, providing a comprehensive understanding of the dynamics at play. Purposive sampling was employed to ensure that participants provided in-depth and relevant information about the use of home language in mathematics teaching (Bell et al., 2022).

3.7 DATA ANALYSIS

Data analysis refers to systematically examining non-numeric data, such as text, audio, video, or images, to identify patterns, themes, or insights that address the research questions (Salmona and Kaczynski, 2024). It which focuses on numerical data and statistical analysis and is concerned with understanding human experiences, behaviours, and social phenomena in-depth.

The study used thematic analysis on interviews, classroom observations, and document analyses. Thematic analysis was chosen because it involves systematically finding patterns and subjects in qualitative data and writing about them (Bell et al., 2022). Before coding, interview data must be entered correctly and structured. Hameed (2024) states that transcriptions were reviewed multiple times to ensure data match and identify themes. Focusing on repeated ideas, words, and concepts that revealed how participants used their home language to teach arithmetic (Fife & Gossner, 2024), the coding was done by hand in phases. The study organised data into key themes and sub-themes to uncover connections between people's experiences and bigger cultural and social elements that affect learning (Dang et al., 2024).

The following steps were followed when analysing the data for this study:

Step 1: Prepare and Structure Data

The first step is to accurately enter and structure the interview, classroom observation, and document analysis data. This ensures the data is ready for further analysis (Hameed, 2024).

Step 2: Review Transcriptions

Transcriptions should be reviewed multiple times to ensure the accuracy of the data and to begin identifying potential themes. This step helps in ensuring the consistency

of data and in confirming that transcriptions match the audio or video recordings (Hameed, 2024).

Step 3: Code the Data

Code the data manually in phases, focusing on repeated words, ideas, and concepts related to how participants used their home language to teach mathematics. This initial coding process identifies key patterns in the data (Fife & Gossner, 2024).

Step 4: Organize Data into Themes

Group the codes into key themes and sub-themes. This step is important for understanding how participants' experiences connect to larger cultural and social influences that impact learning (Dang et al., 2024).

Step 5: Group Data by Research Questions and Theory

Organize the data according to the research questions and theoretical framework. This ensures that the analysis is aligned with the study's goals and enhances the meaningfulness and relevance of the results (Mannheimer, 2024).

Step 6: Employ Inductive and Deductive Reasoning

Use inductive (data-driven) and deductive (theory-driven) reasoning to analyse the data. Inductive reasoning helps identify new insights, while deductive reasoning allows testing existing assumptions, such as those related to Vygotsky's Sociocultural Theory (Dang et al., 2024).

Step 7: Use Participant Quotes

Integrate direct quotes from participants to support the identified themes and provide evidence for the findings. This ensures that the participants' voices are authentically represented and strengthens the credibility of the analysis (Reyes et al., 2021).

Step 8: Contextualize Findings with Literature

Review the study's literature to contextualize the findings and compare participants' responses with those from other studies. This helps position the results within the broader academic discussion, making the analysis more reliable (Naeem et al., 2024).

Step 9: Compare with Culturally Responsive Teaching Strategies

Compare the findings with culturally responsive teaching strategies to understand how home language instruction affects mathematics comprehension. This comparison helps identify how well the study's results align with or challenge existing educational practices (Hossain et al., 2024).

Step 10: Revisit Data Multiple Times

Throughout the analysis process, revisit the coded and sorted data multiple times to ensure the accuracy and depth of interpretation. This step is crucial to ensure a comprehensive and robust analysis of the data (Bell et al., 2022).

This study followed these steps and the data analysed systematically uncovered patterns and insights that relate to how home language influences mathematics teaching and learning in the Foundation Phase.

3.8 DELIMITATION OF THE STUDY

This study was limited to Foundation Phase schools in the Sibasa Circuit, Vhembe East District, Limpopo. Focusing on a specific geographical area allowed for a thorough and accurate examination of how home language is used in mathematics instruction (Fife & Gossner, 2024). The study selected mathematics teachers, parents, school leaders, and curriculum advisors as participants, as they have direct experience or knowledge of the teaching methods involved (Dang et al., 2024). The study was specifically aimed at Teachers and sponsors, rather than learners.

The study focused solely on the use of home language in mathematics instruction, excluding other subjects or aspects of schooling. This focus was informed by Manheimer (2024), who explored the impact of language on mathematics education in the context of the Foundation Phase. As early childhood education plays a critical role in cognitive and language development (Hossain et al., 2024), the Foundation Phase was chosen to provide insight into the development of mathematical understanding during this formative period.

These delimitations helped ensure the study's feasibility and allowed for a comprehensive exploration of the research problem within its appropriate context. By

concentrating on specific areas within the Sibasa Circuit, the study provided valuable information relevant to the local educational environment.

3.9 TRUSTWORTHINESS OF THE STUDY

According to Adler, (2022), trustworthiness in qualitative research refers to the credibility, reliability, and integrity of the study's findings. It is essential for establishing the quality of the research and ensuring that the results are accurate, credible, and reflective of the participants' perspectives. Since qualitative research often involves subjective interpretations, trustworthiness ensures that the research process and outcomes are rigorous, reliable, and transparent. It is crucial for establishing the credibility and reliability of the findings.

This study employed several strategies to ensure the trustworthiness of the data collection, analysis, and interpretation processes. The following subheadings outline the steps taken to ensure the study's trustworthiness.

3.9.1 Credibility

Credibility refers to the truthfulness and accuracy of the research findings. To enhance credibility, this study employed triangulation by gathering data from multiple sources, including interviews, classroom observations, and document analysis. This allowed for a more comprehensive understanding of how home language is used in mathematics instruction. Additionally, member checking was used to verify the accuracy of the data and interpretations by sharing findings with participants for feedback. This process helped ensure that the findings reflected the participants' perspectives.

3.9.2 Transferability

Transferability refers to the extent to which the findings of the study can be applied to other settings or contexts. While this study is focused on Foundation Phase schools in the Sibasa Circuit, the detailed description of the research context, participants, and findings provides sufficient information to allow readers to assess the potential for transferring the study's conclusions to similar educational settings. The study's focus on the use of home language in mathematics instruction may be applicable to other regions with similar educational practices or challenges.

3.9.3 Dependability

Dependability refers to the stability of the findings over time. To ensure dependability, the study followed a clear and transparent research process, including detailed documentation of the data collection and analysis procedures. A peer review process was also employed, where fellow researchers examined the methodology and data analysis to confirm the study's consistency and reliability. This external check contributed to ensuring that the findings were dependable and could be replicated under similar conditions.

3.9.4 Confirmability

Confirmability refers to the extent to which the findings are shaped by the participants' responses rather than researcher bias. To enhance confirmability, the researcher kept detailed field notes and memos throughout the study to document any personal reflections and biases. The use of direct quotes from participants in the findings also allowed the participants' voices to guide the interpretation of the data, ensuring that the results were grounded in the participants' experiences rather than the researcher's perspective.

3.9.5 Authenticity

Authenticity refers to the fair and honest representation of participants' perspectives. In this study, efforts were made to ensure that all voices were heard, especially those of marginalized groups such as parents and community members. By using a variety of data collection methods and providing a platform for participants to share their experiences in their own words, the study aimed to accurately reflect the diversity of views and experiences regarding home language use in mathematics instruction.

By employing these strategies, the study aimed to ensure the trustworthiness of the research process and the validity of the findings. These measures ensured that the study's results were credible, transferable, dependable, confirmable, and authentic.

3.10 ETHICAL CONSIDERATIONS

Ethical consideration refers to the principles and guidelines that govern the conduct of research to ensure that it is carried out morally and transparently (Suri, 2020). Ethical considerations are critical to ensuring the integrity of the research process and protecting the rights and well-being of participants. This study followed several ethical guidelines to ensure that the research was conducted responsibly and respectfully. The following subheadings outline the key ethical considerations followed in this study.

3.10.1. Informed Consent

Informed consent is a fundamental ethical requirement, ensuring that participants voluntarily agree to take part in the study with a clear understanding of the research purpose and their role. Before data collection began, all participants were provided with detailed information about the study, including its objectives, the nature of their involvement, and any potential risks. Participants were given the opportunity to ask questions and were informed that their participation was entirely voluntary. Written consent was obtained from all participants, ensuring that they understood their rights to withdraw from the study at any time without consequence.

3.10.2 Confidentiality and Anonymity

Confidentiality and anonymity are essential for protecting participants' privacy. In this study, all personal identifiers were removed from the data, and pseudonyms were used in place of participants' real names to ensure anonymity. The data collected, including interview transcripts and observation notes, were securely stored and accessible only to the researcher. Participants were assured that their responses would be kept confidential and that their identities would not be revealed in any publications or reports resulting from the study.

3.10.3 Avoidance of Harm

The study was designed to minimize any potential harm or discomfort to participants. Care was taken to ensure that the interview questions and observation methods were not intrusive or sensitive in a way that could cause emotional or psychological distress. Participants were informed that they could choose not to answer any question or

withdraw from the study at any time without facing any negative consequences. Additionally, the researcher maintained a respectful and professional approach throughout the data collection process to ensure participants felt safe and supported.

3.10.4 Voluntary Participation and Right to Withdraw

Voluntary participation is a key ethical principle, and participants were informed that their involvement in the study was entirely voluntary. They were made aware that they had the right to withdraw from the study at any stage without any penalty or loss of benefits. This information was clearly communicated during the consent process, and participants were reminded of their right to withdraw throughout the study, ensuring that they were not pressured or coerced into continuing.

3.10.5 Transparency and Honesty

The researcher was committed to being transparent and honest in all stages of the research process. Participants were fully informed about the purpose of the study, how the data would be used, and any potential risks associated with their participation. Furthermore, the researcher made it clear that the study's findings would be published and shared with the relevant stakeholders, such as Teachers and policymakers, to contribute to the academic community's understanding of home language use in mathematics instruction.

3.10.6 Respect for Cultural Sensitivity

Respecting the cultural values and beliefs of participants was a critical ethical consideration. The study took into account the diverse cultural backgrounds of the participants, especially in terms of language use and educational practices. The researcher was mindful of cultural norms and ensured that the language used in interviews and discussions was respectful and appropriate for the participants' cultural context. Cultural sensitivity was maintained throughout the research process to ensure that participants felt valued and respected.

By adhering to these ethical considerations, the study aimed to uphold participants' rights and dignity while ensuring the research process's validity and integrity. These

ethical guidelines were essential for building trust with participants and ensuring that the research was conducted responsibly, respectfully, and ethically.

3.11 CONCLUSION

Chapter 3 provided a comprehensive overview of the research methodology employed in this study, detailing the approaches, procedures, and ethical considerations followed to ensure the reliability and integrity of the research process. The chapter outlined the study's research design, which utilized a qualitative approach to explore home language use in mathematics instruction within Foundation Phase schools in the Sibasa Circuit, Vhembe East District, Limpopo.

Key aspects of the methodology included the research paradigm, research design population, and sampling procedures, which focused on mathematics teachers, parents, school leaders, and curriculum advisors with direct experience in teaching mathematics. The study's data collection methods—interviews, classroom observations, and document analysis—were carefully chosen to gather rich, detailed information that could address the research questions. Thematic analysis was employed as the primary data analysis method, ensuring that key themes and patterns in participants' experiences were identified and interpreted in a meaningful way.

Ethical considerations were also an essential component of this study, ensuring that the rights of participants were protected and that the research was conducted with transparency, respect, and cultural sensitivity. Informed consent, confidentiality, voluntary participation, and the avoidance of harm were fundamental principles that guided the study.

The chapter also addressed the delimitations of the study, which focused specifically on home language use in mathematics instruction within the chosen geographic area and education phase. These delimitations allowed for a more focused and manageable investigation while ensuring that the findings were relevant and applicable to the study context.

This chapter laid the foundation for understanding the research design and the methodological approach used to explore the impact of home language on

mathematics instruction in the Foundation Phase. The following chapters will present the findings and analysis of the study, building on the methodologies outlined here to provide meaningful insights into the research problem.

CHAPTER 4: DATA PRESENTATION AND ANALYSIS

4.1. INTRODUCTION

This chapter presents the findings and analysis of data collected to explore the effects of teaching mathematics using the home language in the Foundation Phase. The study aims to assess how home language impacts learner's comprehension, engagement, and academic performance in mathematics. It also seeks to identify both the benefits and challenges of adopting the home language as a medium of instruction while offering insight into effective strategies for improving home language-centered teaching.

The data is categorized into four key themes, each addressing a specific research question and objective of the study. The first themes focus on the benefits of home language instruction in mathematics, highlighting its positive influence on learners' ability to understand abstract mathematical concepts and their overall academic confidence. The second theme examines the implication of using home language as a teaching medium, emphasizing cognitive outcomes and learner identity development. The third theme outlines the systemic and pedagogical barriers encountered by teachers in implementing home language-based instruction, including inadequate resources and insufficient teacher training. The fourth theme explores best practices and strategies that can enhance the effectiveness of teaching mathematics in learners' home language, emphasizing the importance of culturally responsive pedagogy and code-switching.

Each theme is presented with supporting data and analysed in relation to relevant literature. The Chapter concludes by synthesising the key findings and offering a basis for the study's recommendation in subsequent chapters. Through this analysis, the study provides a deeper understanding of how home language instruction can bridge the linguistic gap in mathematics education and promote equity in diverse classroom settings.

4.2 DEMOGRAPHICS OF THE PARTICIPANTS

The participants involved in the study comprised 32 individuals representing various stakeholder groups in the education system. The sample included 10 teachers, 5

Departmental Heads (HODs), 15 parents, and 2 curriculum advisors. This diverse cohort provided a broad spectrum of perspectives on the use of home language in mathematics instruction at the Foundation Phase. Among the teachers, the majority were experienced Teachers with a minimum of five years of teaching experience in the Foundation Phase. Their familiarity with the curriculum and pedagogical challenges made their insights particularly valuable. However, variations in fluency in learners' home languages were observed among the teachers, particularly in multilingual classrooms. This aspect highlighted the practical obstacles of implementing home language instruction in schools with diverse linguistic environments. The HODs, serving as the academic leaders within their respective schools, had in-depth knowledge of the policy and practice dimensions of implementing home language instruction. Their oversight roles allowed them to identify systemic challenges and opportunities for resource allocation and teacher training.

The parents represent various socio-economic backgrounds; their primary language is Tshivenda at home. Their involvement was crucial in understanding the intersection between home and school environments. Many parents expressed enthusiasm for the initiative, noting positive changes in their children's confidence and interest in mathematics. However, concerns about the transition to English-medium instruction in higher grades were also prevalent. The two curriculum advisors brought a broader perspective, informed by policy implementation and curriculum design at the district level. Their insights focused on the long-term feasibility of integrating home language instruction and its alignment with national education goals

4.3 SUMMARY OF THEMES AND SUB-THEMES

The data analysis revealed four primary themes and sub-themes reflecting participants' varying viewpoints. These themes support home language mathematics instruction assessment studies.

Major Theme	Sub-Themes
Benefits of Using Home Language for Teaching Mathematics	**Sub-Theme 1**: Improved comprehension of mathematical concepts. **Sub-Theme 2**: Enhanced learner engagement and participation.
	Sub-Theme 3: Boosted confidence and academic performance. **Sub-Theme 4**: Strengthened connection between home and school through parent involvement.
Implications of Home Language Instruction in Mathematics	**Sub-Theme 1**: Development of critical thinking skills through familiar language. **Sub-Theme 2**: Increased learner confidence and identity affirmation. **Sub-Theme 3**: Impact on assessment outcomes and academic achievement. **Sub-Theme 4**: Motivation and sustained interest in mathematics.

Systemic and Pedagogical Barriers in Home Language-Based Mathematics Instruction	**Sub-Theme 1**: Lack of standardized terminology in home languages. **Sub-Theme 2**: Insufficient teacher training and resources. **Sub-Theme 3**: Multilingual classrooms and challenges in language diversity management. **Sub-Theme 4**: Parental skepticism regarding English proficiency development.
Effective Teaching Strategies and Best Practices	**Sub-Theme 1**: Integration of culturally responsive pedagogy in mathematics. **Sub-Theme 2**: Effective use of code-switching for dual-language learning.
	Sub-Theme 3: Implementation of visual aids and manipulatives for conceptual clarity. **Sub-Theme 4**: Collaborative learning approaches to enhance understanding and retention.

4.4 MAJOR THEME 1: BENEFITS OF USING HOME LANGUAGE FOR TEACHING MATHEMATICS

4.4.1 Sub-Theme 1: Enhanced Comprehension of Mathematical Concepts

From the interviews conducted with the participants, it was discovered that Foundation Phase mathematics learners learn better in their home language. Participants believed learners learn mathematics better in their home language. Knowing linguistic frameworks lets learners focus on arithmetic instead of translation. Parents, teachers, and curriculum advisers reported improved addition, subtraction, and fraction knowledge when home language terms simplified abstract ideas. Learners' problem-solving skills increased when they could explain their reasons in their home languages. Some stakeholders questioned this technique's long-term impacts, especially the transfer to English in higher grades.

Quoted Responses:

"When my child started learning mathematics in their home language, they seemed to understand the concepts better. It's like they don't struggle to get the instructions" (Participant 1, Parent).

"I used the phrase 'Tusa' instead of 'subtract,' and suddenly, the whole class got it. Before that, with English, most of them seemed confused" (Participant 1, Teacher).

"Learners relate better to word problems involving their context, like counting mangoes or sharing bread. It's practical and relatable" (Participant 2, HOD).

"Using Tshivenda, my son can follow along without getting stuck on the language. It removes the extra layer of difficulty" (Participant 8, Parent).

"The home language allows the children to grasp concepts without worrying about the terminology; they focus on solving the problems instead" (Participant 10, Teacher).

These responses demonstrate stakeholder consensus. Parents said familiar language helped learners overcome mathematics problems. Teachers said even indifferent learners participated and understood more. The department head and curriculum advisors said this technique increases learners' performance by simplifying

comprehension and strengthening mathematical reasoning. Problems remain with mixed-language classrooms and home languages without mathematical terminology.

These findings confirm and contradict prior research. Home language enhances cognitive development and math comprehension in early education, according to Setati and Adler (2021). Heugh et al. (2020) suggest young children learn best in their native language. These alignments show how home language teaching enhances conceptual understanding. Over-reliance on home language education without gradual English integration can hinder academic transitions (Ngcobo and Mlambo, 2022). This discrepancy demands balanced implementation strategies like multilingual teaching materials and scaffolding English terminology with home language concepts.

For Teachers, these findings underline the need for inclusive and accessible learning environments. Home language training provides many benefits, but terminology standardization and English transition are necessary for long-term success. Cultural and language familiarity helps teachers teach mathematics and bilingualism.

4.4.2 Sub-Theme 2: Increased Learner Engagement and Participation

Statistics show that teaching arithmetic in learners' home languages increases classroom participation. Stakeholders agreed that familiar language helps children engage with teachers and classmates. Teachers discovered learners are more willing to ask questions, solve difficulties, and participate in group discussions. Parents noticed increased interest and confidence in their children's mathematical lessons. Even quieter English-challenged learners spoke their own language better. This dynamic transition fosters active learning and collaboration.

Quoted Responses:

"My daughter used to avoid mathematics altogether, but now she comes home excited to show me what she's learned. She even tries to teach her little brother!" (Participant 3, Parent)
"Learners participate more actively because language barriers do not hold them back. They explain their reasoning confidently in their own words" (Participant 6, Teacher).
"The classroom feels much more lively when I teach in their home language. Even the shy ones raise their hands to answer questions" (Participant 5, Teacher).

"I've noticed that learners who were disengaged before are now eager to join group activities and share their ideas" (Participant 8, HOD).

"Using Tshivenda, my daughter has become more confident. She no longer hesitates to tackle problems in front of her classmates" (Participant 7, Parent).

These studies link engagement and involvement to linguistic barrier removal. With learners working together, teachers observed improved group dynamics. Home reports of increased excitement support these classroom experiences. Some participants were concerned about keeping interest when transitioning to English-medium schooling in higher grades.

A literature review supports these findings. Alexander (2021) claims home language instruction fosters belonging and minimises classroom anxiety. Cummins (2020) discovered that mother tongue training enhances young learners' self-esteem and social confidence. Critics like Brock-Utne (2022) argue that over-reliance on home language instruction may limit learners' academic English exposure and inhibit their multilingualism. Progressive transitions and home language-English instruction are emphasised in this dual perspective.

Teachers and governments must assess the benefits of short-term involvement against multilingual competency goals. Bilingual classroom tools, peer-assisted learning, and teacher professional development keep children engaged and ready for academic challenges. Flexibility and learner-centeredness allow the educational system to maximise home language training for dynamic, inclusive, and effective learning.

4.4.3 Sub-Theme 3: Improved Learner Confidence and Academic Performance

The semi-structured interviews suggest that home language instruction improves mathematics confidence and performance. Teachers, parents, and curriculum advisers found that using learners' home languages reduced language translation cognitive strain, letting them focus on arithmetic. Mathematics was easier to understand in a familiar language. Teachers saw hesitant learners participating more in class discussions, indicating increased self-confidence and comfort with the subject.

Parents said their children's mathematics attitudes changed as they were more willing to finish homework and share their new knowledge.

Quoted Responses

"My child now likes mathematics more than before. Before this, they'd avoid doing mathematics homework. Now, they actually show me what they've learned, even without me asking. It's amazing to see them so confident!" (Participant 1).

"Teaching in Tshivenda has made mathematics easier for my daughter to understand. Before, she would struggle with both the language and the mathematics itself. Now, it's like she can focus on the mathematics without being confused by the words." (Participant 7).

"Learners grasp concepts much quicker when we teach in their home language. It's like there's no barrier in understanding, so they focus on the math itself instead of struggling with the language." (Participant 3, Teacher).

"I explained subtraction using the phrase 'Tusa' (take away), and suddenly, the whole class got it. Before that, with English, most of them seemed confused. It was a real eye-opener." (Participant 1, Teacher).

"When mathematics is taught in Tshivenda, my son can focus on the numbers and concepts instead of trying to figure out what the teacher is saying. It's a big difference, especially at this young age." (Participant 6).

The participant extracts demonstrate that home language education empowers learners by removing language obstacles. Familiar lingo lowers learners apprehension and promotes active learning and problem-solving. Learners reinforce their learning by explaining things in their own tongue. Teaching culturally appropriate examples, such as applying mathematics to eating together, helped learners contextualise and retain information, according to teachers. The increased confidence was generally praised, but some participants worried about the long-term repercussions of moving to English instruction and underlined the need for progressive bilingual terminology integration to maintain these advantages.

These findings confirm studies indicating home language promotes learner engagement and comprehension. Setati and Adler (2020) found that employing

learners' primary languages reduces cognitive strain from learning mathematics in a second language in multilingual classrooms. Alexander (2019) says teaching in the home language enhances fundamental understanding, which is needed for higher-order thinking. The balance between home language instruction and later-grade English ability is contested. Cummins (2021) favours dual-language approaches to facilitate transitions, although Brock-Utne (2020) warns against over-reliance on home language due to complications shifting to English-medium instruction. According to this study, home language-based training improves academic and social performance. Such methods improve learning environments by increasing confidence and participation. Participants stressed the importance of intentional linguistic integration to prepare learners for academic obstacles.

4.4.4 Sub-Theme 4: Strengthened Connection Between Home and School Environments

Home-language mathematics instruction helps learners connect to school. When instructions and materials were in their language, parents found helping with academics easier. It developed a collaborative learning environment that engaged parents in their children's education. Class topics were reinforced by learners discussing their studies at home, according to teachers and curriculum experts. Mathematics was also linked to learners' cultural identities, giving them pride and relevance in their studies.

Quoted Responses

"When the teacher uses Tshivenda, the concepts make more sense to my daughter. She doesn't feel as lost as she did when everything was in English. It also gives her confidence because she can actually solve the problems without feeling lost." (Participant 3).

"Parents can assist with homework since they understand the language of instruction, which creates a strong link between home and school." (Participant 5, Teacher).

"My son now asks me to quiz him on mathematics problems, something that never happened before. Teaching in Tshivenda has made a noticeable difference in how we engage with his schoolwork." (Participant 12).

"I think teaching mathematics in Tshivenda is not just good for understanding—it shows the learners that their home language is valuable for learning important things too. It bridges school and home in a powerful way." (Participant 13).

"Parents feel more comfortable engaging with the school when the language used is one they know. It creates a partnership that benefits the learner." (Participant 9, Curriculum Advisor).

Mathematics in the home language changes parental participation, as seen in samples. Parents with limited language skills are passionate about their learners' education. Parents and teachers supporting learners in both environments boosted learning. Culturally relevant examples in classes made learners proud of their heritage and inspired them to succeed. Teachers stated these improved home-school links helped them communicate with parents and solve problems.

The findings corroborate home language and family education studies. Linguistically appropriate instruction engages families in learning, according to Heugh (2021). Home language instruction strengthens school-community relationships, enhancing learners' achievement, according to Benson (2020). Trudell (2019) believes home language education may not be fully fulfilled without sufficient training and resources, especially in resource-constrained contexts.

The study found that home language promotes family-school relationships and creates a cohesive support network for learners. Despite resource constraints, this method appears to have outweighed its negatives. Home language instruction increases inclusivity and collaboration, improving academic performance and the school community.

4.5 MAJOR THEME 2: IMPLICATIONS OF HOME LANGUAGE INSTRUCTION IN MATHEMATICS

4.5.1 Sub-Theme 1: Development of Critical Thinking Skills

Interviews suggest home language mathematics training increases critical thinking. Teaching mathematics in the original language enables learners to focus on problem-solving and conceptual understanding, not linguistic barriers, according to several participants. Since familiar language reduces intimidation, teachers found learners

more comfortable asking questions and exploring new ways. Parents also saw their learners' arithmetic engagement improve, applying it to daily life. Participants said local language word problems helped them think logically. Long-term effects were questioned, including learners' ability to transfer abilities to English-medium instruction.

Quoted Responses

"When I use their home language to explain a problem, they immediately start thinking of solutions without hesitating. It's like the familiarity of the language gives them the courage to explore." (Participant 3, Teacher)

"My daughter used to avoid mathematics, but now she explains problems using stories from her daily life. She thinks critically about numbers and steps involved in solving problems." (Participant 8, Parent)

"I noticed that learners feel empowered to challenge ideas when the lesson is in their home language. They are not afraid to question or suggest alternative methods." (Participant 2, Head of Department)

"Using Tshivenda helps the children see math as something connected to real life, not just abstract problems. This builds their reasoning and critical thinking." (Participant 5, Teacher)

"Even when they solve a problem in class, they are quick to suggest practical examples from their homes, which shows deep understanding and critical analysis." (Participant 7, Curriculum Advisor)

The results show that in the Foundation Phase, children learn critical thinking by learning mathematics in their home language. When they can absorb and communicate topics in a familiar language, learners may focus on mathematical reasoning rather than memorisation. Since children are more willing to share ideas, teachers say this technique promotes teamwork and innovation. Parents claimed that home language instruction's realistic context helps with problem-solving outside the classroom since children utilise them in daily life. However, uniform terminology and English-medium educational preparation may inhibit critical thinking.

Research validates interviews' findings that home language teaching boosts higher-order cognition. Learners taught in their first language solve issues more actively, developing critical thinking, according to Setati and Planas (2020). Alidou et al. (2019) found that native-language learners apply mathematics better. Studies like Cummins (2021) indicate that delayed English terminology introduction may hinder cross-language critical thinking. Interview data complement these findings and show how learner confidence and reasoning in a familiar language affect them immediately.

The literature strongly suggests that Foundation Phase home language training improves critical thinking, notwithstanding some misgivings. How to seamlessly integrate English while retaining the cognitive benefits of home language instruction is tricky. Makalela (2020) advises gradually introducing bilingual resources to bridge languages and improve multilingual learners' critical thinking.

The findings stress home language training to unlock numerical potential. Making learners feel secure and involved in the material promotes critical thinking and academic performance. To sustain these benefits and ensure higher-level instruction preparedness, stakeholders must solve the identified challenges.

4.5.2 Sub-Theme 2: Positive Impacts on Learner Identity and Cultural Pride

Statistics show home language mathematics instruction affects learners' identity and cultural pride. The interviews showed that learners were more interested in mathematics courses and were proud to explain subjects in their own language. Teachers noted that learners regularly linked mathematics problems to cultural and daily activities, enhancing their connection to the topic and history. Parents agreed, observing their learners' confidence and enthusiasm in talking mathematics with relatives. The pride went beyond mathematics, increasing learners' self-esteem and cultural connection. Some participants worried about balancing this strategy with preparing learners for English-medium education, highlighting gradual English term integration.

Participants' vivid stories showed these encounters:

"My daughter used to say mathematics was hard, but now she enjoys it. She even teaches her little brother by using examples from Tshivenda. I think it's because she understands better and feels proud of her language" (Participant 3, Parent).

"When learners solve problems in Tshivenda, they don't just do the math; they share stories about how their families use these ideas, like sharing food. It makes them feel like math is part of their lives" (Participant 5, Teacher).

"My son proudly explains multiplication in Tshivenda to anyone who will listen. It shows him that his language is valuable, even for learning" (Participant 8, Parent).

"Learners are excited to use Tshivenda in class. They often discuss how their parents or grandparents solved similar problems, which reinforces their cultural pride" (Participant 6, Teacher).

"Using Tshivenda for mathematics connects learners to their roots. One learner said, 'This is how my grandmother taught me to count the chickens,' and it showed me how culture shapes their understanding" (Participant 7, Teacher).

These examples indicate that teaching mathematics in learners' home languages boosts pride and links academics to culture.

Further analysis shows that learners associate home language instruction with belonging and heritage respect. Teachers said culturally relevant examples in mathematics difficulties engaged learners and made the topic more approachable. This method enhanced peer collaboration because learners felt more comfortable speaking their home language. As homework became easier, parents became more involved, improving learning. Some teachers found it challenging to balance cultural pride with English-medium preparation.

Our findings support past studies compared to the literature. Setati and Adler (2020) discovered that using their home language in mathematics improves comprehension and confidence because learners can absorb mathematical concepts without translation. Culturally aware teaching boosts academic performance and cultural pride, according to Ball (2021). The findings support Cummins' (2019) theory of linguistic interdependence, which holds that being proficient in one language helps learners acquire others, solving English proficiency issues. Moschkovich (2020)

advises against over-reliance on native language and recommends early introduction to technical English terminology for academic success. This contrast highlights the necessity to balance cultural pride and multilingualism.

The data strongly show that home-language mathematics training boosts academic performance and cultural pride. This approach encourages diversity and holistic education by integrating mathematics and culture. Maintaining these benefits requires a coordinated multilingual materials and teacher training system. Learners can maintain their culture and prepare for academic challenges with this balance.

4.5.3 Sub-Theme 3: Effects on Assessment Outcomes and Achievement Levels

The semi-structured interviews reveal that teaching mathematics in the learners' home language improves knowledge, engagement, and confidence, which improves assessment scores. According to parents and teachers, learners learn addition and subtraction better using familiar terminology. Easy comprehension improves exam scores and success. Other respondents warned that a poorly managed English-medium transition could negate these gains.

Many parents said their children's mathematics confidence increased, increasing class performance. Teachers agreed that learners' cognitive burden decreases when they don't translate mathematical words from English to their home language. To circumvent the lack of established home language vocabulary for complicated mathematical concepts, some teachers improvise.

Quoted Responses

"My daughter used to cry over math homework because she didn't understand it. Since they started teaching in Tshivenda, she solves problems with confidence and scores better on tests." (Participant 6, Parent)

"I've noticed that when we assess learners in the home language, their performance is consistently better. They don't waste time trying to understand instructions; they get straight to solving problems." (Participant 2, Teacher)

"Using Tshivenda makes math less intimidating for my son. He recently scored full marks on a test about fractions because he understood the concept better in his language." (Participant 9, Parent)

"In assessments, learners taught in their home language participate more actively and score higher compared to when tests are in English. It's clear they grasp concepts better." (Participant 4, Head of Department)

"Parents have reported that their children feel more comfortable with math, leading to improved results in both formative and summative assessments." (Participant 8, Curriculum Advisor)

According to a qualitative study, evaluations in learners' home languages remove the linguistic barrier to English education and increase results. Learners' analytical and problem-solving skills increase when they contextualise problems in their culture and language, especially in fundamental mathematics. Teaching mathematics in the native language makes the classroom friendlier and boosts test-taking confidence.

However, interviews exposed crucial concerns. Unstandardised native language terminology for complex mathematical concepts may cause assessment design and grading problems. This issue may affect English-intensive upper grades' performance. Thus, while home language education improves assessment results, sustained success requires organised interventions to address these difficulties.

This study supports the idea that Foundation-Phase home language training improves comprehension and assessment. According to Heugh and Skutnabb-Kangas (2020), teaching basic ideas in learners' home languages improves cognitive and academic performance. According to Ball (2021), early home language education overcomes cognitive and linguistic differences, helping learners grasp numbers.

Benson (2022) discovered that unstructured transition to English-medium instruction may reduce the benefits of home language learning. Several were worried about learners' long-term English exam adaption. Home language instruction is vital to English academic performance.

These findings show that home language instruction improves foundation phase evaluation outcomes. To succeed, this method requires a deliberate shift to English-

medium instruction, multilingual materials, and teacher training. The research suggests a blended educational paradigm that protects home language learning benefits and prepares learners for future language requirements.

4.5.4 Sub-Theme 4: Challenges in Transitioning to English-Medium Instruction

Based on interviews, Foundation Phase learners struggle to switch from their home language to English. Home language training promotes conceptual understanding and confidence, while switching to English causes doubt, disengagement, and academic decline, according to all participants. Parental concerns about their children's superior mathematics skills translating to English were common. Teachers reported a language gap when learners were reintroduced in English and had problems retaining or applying concepts. Learners need organised interventions to maintain basic information and prepare for academic challenges in this dual-language situation.

Quoted Responses

"I noticed that my daughter, who was confident with subtraction in Tshivenda, suddenly became hesitant when the same concept was taught in English. She would say, 'I don't get it, Mma,' which was heartbreaking because I knew she understood it before" (Participant 3, Parent).

"When my learners transition to Grade 4, I see them struggle with mathematical terms like 'numerator' and 'denominator.' They know the concept in their home language but can't connect it to the English terms" (Participant 2, Teacher).

"The biggest challenge is that we have to reteach the same concepts, now in English, and this takes up valuable teaching time. It feels like starting over" (Participant 4, Teacher).

"Parents often ask us how they can help their children adjust, but they feel equally lost because they've only been exposed to the home language terms as well" (Participant 1, Head of Department).

"The learners I work with show frustration during assessments because they cannot relate the mathematical instructions in English to what they learned in their home language" (Participant 5, Curriculum Advisor).

According to data, these obstacles lower learners' grades and worry teachers and parents. Within constrained curriculums, teachers must reinforce basics and introduce new terms. Parental help is hard because they don't understand English mathematics. Due to this dual load, bilingual transition services are needed.

These data, like Setati and Adler (2021), imply mathematics education's language flip impairs learning continuity. Their fluency strategy is frequent exposure to their home tongue and English phrases. Sibanda (2020) suggests gradually adding English phrases to home language teaching to facilitate transition. According to Barwell (2019), dual-language learning's cognitive burden may hinder language competency, requiring further investigation. Despite distinctions, a multilingual educational tool scarcity worsens it. Participants indicated inconsistent vocabulary across languages promotes misconceptions. Alexander (2021) contends that parental concerns about English competency reflect a cultural and societal emphasis on English as a language of advancement. Home language teaching boosts confidence and understanding but doesn't prepare them for English-medium education.

4.6 MAJOR THEME 3: SYSTEMIC AND PEDAGOGICAL BARRIERS IN HOME LANGUAGE-BASED MATHEMATICS INSTRUCTION

4.6.1 Sub-Theme 1: Lack of Standardized Mathematical Terminology in Home Languages

The semi-structured interviews revealed considerable obstacles due to the lack of standardised mathematical terminology. Teachers, HODs, parents, and curriculum advisers said the lack of standardised vocabulary hindered teaching and learning. Teachers often had to coin or adapt terms during lessons, causing discrepancies. One Teacher mentioned, *"I used the phrase 'Kovha' for Division, but other teacher uses something different. Learners get confused when they switch classes"* (Participant 3). HODs said teachers must balance conceptual clarity and language precision. Home language teaching was encouraged, but parents struggled to teach their children new vocabulary, especially for complex themes. This inconsistency was supposed to hinder learners' English terminology transfer in later years.

Quoted Responses:

"When teaching symmetry, I had no direct term, so I had to use descriptive explanations. It's exhausting because learners often forget the English term" (Participant 7, Teacher).

"We teachers create our own words sometimes. It's confusing because parents or other teachers might use different terms" (Participant 10, Teacher).

"As a parent, I struggle to help my son with homework when terms like 'denominator' because we do not have an exact word to explain the term in Tshivenda. I end up googling" (Participant 8, Parent).

"The Department of Education has not provided us with resources to standardize these terms, leaving each teacher to figure it out" (Participant 1, HOD).

"I think standardized glossaries for home language mathematics would make a big difference in addressing confusion" (Participant 4, Curriculum Advisor).

Teachers, parents, and children are frustrated by systematic non-standardization. Improvised language by teachers indicates a lack of professional support. The responses underline the necessity for legislation to formalise mathematical terminology in all major home languages. In bilingual classrooms, Teachers may use different invented words. Thus, learners struggle to learn and retain, reducing academic confidence. Parents struggle to give enough support due to foreign language, dividing home and school-based learning.

The findings confirm Setati and Planas (2021), who say linguistic resources hinder home language teaching. These researchers say standardising mathematical terminology promotes conceptual clarity and grade-level understanding. According to Adler (2019), improvised language can produce cognitive dissonance because learners may struggle to reconcile diverse readings of the same idea. According to Webb (2020), advanced learners can increase creative problem-solving through improvisation. This study shows that the adverse effects outweigh the advantages. Terminology gaps restrict information flow between teachers and learners and between home and school, supporting Ball (2022)'s claim that bilingual children's mathematics ability is hampered by terminology gaps.

The lack of standardised terminology weakens South African education policies and home language instruction equity and perpetuates educational disparities. These findings underline the necessity for policymakers, linguists, and Teachers to collaborate on glossaries and training resources. These resources could bridge language gaps and link home language-based learning with the national curriculum.

4.6.2 Sub-Theme 2: Multilingual Classrooms and Language Diversity Challenges

Interviews reveal that multilingual schools make home-language mathematics instruction challenging. Teaching many languages in one classroom hinders lesson delivery since teachers must switch between them to ensure comprehension. Learners in these situations find mathematical terminology portrayed inconsistently across languages confusing. Performance disparities and learning difficulties may result from this instability. The lack of multilingual standardised resources burdens teachers who design their own lessons. Some learners flourish in their native language, but others feel excluded if their first language is not addressed, splitting classroom participation and interest.

Quoted Responses:

"In my classroom, I have learners who speak Tshivenda and English(as their home language). When I explain something in Tshivenda, I see one group nodding, but the others look confused. It's hard to strike a balance." (Participant 1, Teacher)

"The biggest challenge is switching between languages English and Tshivenda. Sometimes, I spend more time translating than teaching math concepts." (Participant 5, Teacher)

"We don't have enough resources in all the languages spoken in the classroom. Most materials are either in English or one dominant language." (Participant 2, HOD)

"It's frustrating for learners when they don't understand what their peers are learning just because their home language is different." (Participant 3, Parent)

"I often have to use visual aids because there's no single language all my learners understand well." (Participant 6, Teacher)

The foregoing responses demonstrate how multilingual mathematics instruction can be challenging and hinder inclusive learning. Teacher pressure to translate, give content, and mediate cultural differences distracts them from mathematics. Visual tools and peer support demonstrate multilingual training creativity and systematic flaws. Educational inequality is also caused by unequal access to understandable instruction.

Researchers corroborate resource shortages and inconsistent terminology in bilingual mathematics instruction (Setati, 2020; Moschkovich, 2019). Setati (2020) says language variation complicates teaching, especially in schools lacking a multilingual policy. A consistent framework that presents mathematical words in both their native language and the language of wider communication benefits multilingual learners, according to Moschkovich (2019). The research found a lack of qualified teachers and resources.

According to García and Wei (2021), translanguaging encourages learners to use their entire linguistic repertoire. This method uses peer training and visual aids like some participants but needs systemic assistance. The disagreement between these theories emphasises the need for bilingual classroom approaches.

Systemic changes like multilingual resources and teacher training are recommended. Policy goals and classroom reality collide, stressing the need for infrastructural and pedagogical adjustments to achieve mathematics education inclusion and equity.

4.6.3 Sub-Theme 3: Insufficient Resources and Teaching Materials in Home Languages

Semi-structured interviews reveal that scarce resources and teaching materials impair home language mathematics education. Participants had trouble finding math-focused home-language textbooks, visual aids, and manipulatives. Teachers complained that making their own materials hinders course preparation and delivery. Lack of resources hinders education and puts Teachers under pressure to innovate without institutional support. Several participants said course inconsistencies originate from home language terminology issues. One teacher proposed improvised translations for “denominator” and “axis,” which may confuse English-medium learners when they encounter formal mathematical vocabulary.

Parents and curriculum consultants observed the support materials scarcity. Home language instruction has many benefits, but curriculum-aligned instruments are needed. Home language-based education varies since there is no centralised system for developing or disseminating such resources, according to curriculum consultants.

Quoted Responses:

"There are very few textbooks or teaching aids in Tshivenda for mathematics. We often have to improvise or rely on outdated materials that don't align with the current syllabus" (Participant 1, Teacher).

"In my experience, terms like 'symmetry' don't have direct translations, so I have to explain using examples or visual aids. It's exhausting to create these resources from scratch every time" (Participant 6, Teacher).

"As parents, we want to help, but if the school doesn't provide materials in Setswana, it becomes difficult to follow what the children are learning" (Participant 3, Parent).

"The Department of Education needs to prioritize producing materials in home languages. Without these, we're essentially asking teachers to perform miracles" (Participant 2, Curriculum Advisor).

"Learners are at a disadvantage when teachers use makeshift resources because the concepts aren't consistently explained across schools" (Participant 4, Head of Department).

The responses demonstrate the systematic lack of home language teaching materials, which hinders instruction. Teachers need to create their own resources promotes inconsistency and hinders their capacity to improve learners' involvement and understanding. As they can't assist their children in learning, parents' fears demonstrate this division beyond the classroom. The lack of defined terminology makes it hard for learners to mix home language education and English-medium learning. Policy goals and practical execution differ. Therefore, curriculum adviser critiques emphasize the need for centralized provision of high-quality, curriculum-aligned materials in many home languages.

Our findings corroborate multilingual education studies that highlight resources. Lack of textbooks and organised materials in home languages inhibits mother-tongue

education, notably in mathematics. According to Adler (2020), Gutiérrez, and Rogoff (2021), resource restriction reduces the benefits of teaching in-home languages by increasing the burden on individual teachers, who may lack the skills or competence to fill these gaps. The Department of Basic Education (2019) promotes inclusive and equal home language education funding, although the data disagree. It appears that policy frameworks exist but are not implemented.

Setati and Adler (2019) caution that improvised teaching materials can introduce mathematical themes differently, hurting learners in standardised assessments. These flaws mirror participants' language and teaching complaints. Participants proposed bilingual textbooks and shared resources, and Moyo (2022) argues that even modest home language instruction can be effective with visual aids and multilingual support materials.

To address resource shortages, home language-based mathematics instruction needs systematic intervention. Teachers and parents' adaptations are commendable, but they may fail without institutional support. Create and distribute home-language standardised teaching resources for educational uniformity and equity. Teachers, linguists, and legislators might create multilingual tools to bridge home language with English-medium instruction. Teacher burden would be reduced, and learners would be prepared for English-dominated classrooms.

4.6.4 Sub-Theme 4: Limited Teacher Training and Preparedness

The interview data demonstrates that low teacher training adversely impacts Foundation Phase home language-based math instruction. Teachers often complained about the dearth of native-language mathematics training. Many interviewees had trouble translating mathematical vocabulary into their home languages, especially when words had no clear equivalents. This deficit caused improvisation and classroom disruptions. Multiple teachers acknowledged adopting ad hoc methods to teach abstract concepts like fractions and geometry, which were challenging to standardise. The lack of bilingual teaching tools forced teachers to produce their own materials, increasing their burden. Teachers and department directors feared that the lack of regular professional development seminars left them unprepared to teach mathematics and maintain home language purity.

Quoted Responses:

"I feel like I'm teaching the same lesson twice because I have to explain in the home language and then introduce the English terms later, which takes time I don't always have." (Participant 4, Teacher)

"Some mathematical concepts just don't exist in our home language, so I have to create my own terms or simplify, and I'm not always sure if I'm doing it correctly." (Participant 2, Teacher)

"I'd say one of the biggest challenges is that teachers don't have enough training in how to create home-language teaching materials. We are left to figure it out ourselves." (Participant 1, Teacher)

"The lack of proper resources in the home language puts a lot of pressure on us. Without textbooks or guides, we have to improvise, which is not ideal." (Participant 3, Head of Department)

"Workshops on blending English and home language instruction would help us a lot, especially for abstract topics like geometry or algebra." (Participant 6, Teacher)

These remarks suggest that a lack of formal training leads to disjointed mathematical education, and teachers feel unsupported in home language teaching.

The statistics also suggest that teachers' improvised methods are a temporary fix that cannot replace professional pedagogy. Practical examples and visual aids are not scalable teaching methods. Lack of defined terminology confused learners, especially when transferring languages or going to higher classes in English, according to teachers. This shows a gap between home language instruction's theoretical benefits and classroom implementation.

Inadequate bilingual teacher training is supported by research. Alexander (2020) believes that home language-based learning requires well-prepared Teachers to supervise mathematics and language teaching. Teachers in this study needed targeted professional development. The findings also contradict Setati and Adler (2019), who say informal methods boost learners achievements. The study indicated that informal options may provide quick relief but are unsustainable without structured assistance.

The findings confirm Heugh et al. (2021) claim that bilingual teaching tools bridge linguistic and pedagogical gaps. This study's limited resources reflect global education system underfunding, notably in sub-Saharan Africa. Despite parental participation being recommended as a mitigating factor (Makalela, 2020), this study's participants did not consider it a major factor in teacher training deficiencies.

4.7 MAJOR THEME 4: EFFECTIVE TEACHING STRATEGIES AND BEST PRACTICES

4.7.1 Sub-Theme 1: Integration of Bilingual Terms and Gradual Transition to English

Bilingual words in arithmetic instruction and English transition were discussed in interviews. Participants complimented a hybrid approach that introduces mathematical ideas in their home languages before adding English terminology to increase comprehension. Parents, teachers, and curriculum advisers believed such tactics improved conceptual understanding and learners' confidence, especially in the foundation phase. They worried about consistency, especially in bilingual schools, and later English preparation.

Several parents said progressively introducing English terminology helped their children acquire dual understanding, which made transitioning to English-medium instruction easier. Teachers worried about creating or translating bilingual content without standard resources. HODs recognised the strategy's long-term benefits but underlined the necessity for institutional support and policy frameworks to streamline it.

Quoted Responses:

"When my son started learning mathematics in Tshivenda, he grasped the concepts better. They introduced the English words slowly, and now he knows both, which I think will help him later." (Participant 2, Parent)

"I explained 'numerator' as the top number in a fraction and said, 'We call it 'numerator' in English.' Learners seemed to retain both terms better this way." (Participant 5, Teacher)

"The school should gradually introduce English alongside Tshivenda. That way,

learners won't feel lost when they move to English-medium instruction." (Participant 3, Parent)

"The balance is challenging. We want learners to understand mathematics deeply in their home language, but we must prepare them for future English needs." (Participant 1, HOD)

"Bilingual materials are essential. They help learners see how the terms connect, which eases the transition to English." (Participant 3, Curriculum Advisor)

Mathematics training with bilingual terms bridges language gaps. Participants agree that home language familiarity enhances comprehension, and early English exposure boosts grades. This approach improves confidence and minimises cognitive stress. Parents reported increased participation, and teachers stated multilingualism made abstract subjects easier to understand.

Unstandardized bilingual resources cause inconsistencies. Teachers' impromptu translations differ per classroom, which may affect learning. Multilingual classrooms make integration harder since teachers must satisfy different linguistic needs. These results show that while the technique is generally successful, it needs systematic support, such as teacher training and resource development, to overcome these challenges.

Studies recommend bilingual mathematical training for young learners. García and Lin (2019) suggest translanguaging as a teaching method that enables learners to utilise their entire linguistic repertoire for academic purposes. Bilingual terms corroborate Cummins' (2021) threshold theory that home language proficiency enhances cognitive development and second-language acquisition. Dual exposure helps abstract and quantitative reasoning.

Findings challenges match previous studies. Insufficient standardised terminology and indigenous language materials are teacher problems, according to Setati and Adler (2020). Heugh et al. (2019) say multilingual classrooms need greater scaffolding and instructor flexibility.

Participants' observations confirm these scholarly views and stress context-specific therapies. The frequent offer of multilingual resources highlights realistic transition strategies. Using English terminology seems to ease parents' concerns about

language proficiency, but the statistics suggest that these efforts must be systematised to ensure consistency and equity in training.

4.7.2 Sub-Theme 2: Use of Culturally Responsive Teaching Methods

Semi-structured interviews show parents, teachers, and department heads support culturally relevant teaching. Many participants said cultural backgrounds assist learners in relating numbers to their daily lives, improving comprehension and recall. Fractions and symmetry were taught using cultural examples like sharing meals and customary patterns. This strategy grounded abstract concepts and enhanced learners' confidence. Parents reported that such approaches promoted ethnic pride, which enhanced children's mathematical attitudes. However, home language terminology and instructor proficiency were difficult. These issues indicate that culturally responsive education requires assistance and resources.

Quoted Responses

"When teachers use examples like sharing bread or counting mangoes, learners immediately understand. It connects math to their real lives, making it easier to grasp." (Participant 2, Parent)

"I explained symmetry using traditional beadwork patterns, and the learners engaged enthusiastically. It was like they saw math in their world for the first time." (Participant 3, Teacher)

"Learners relate better to concepts like fractions when we use examples from their daily lives, like slicing bread or dividing fruits." (Participant 4, HOD)

"By using culturally familiar examples, the learners not only understood faster but also participated more actively in class discussions." (Participant 8, Teacher)

"The use of local contexts in math lessons makes the subject less intimidating and builds a bridge between home and school environments." (Participant 10, Parent)

Culturally relevant teaching improves learners' engagement and understanding, as seen above. Beadwork helped Participant 3 demonstrate how local traditions may clarify complex concepts in mathematics. Participant 8's note on active involvement underlines how familiarity boosts confidence. Data show systemic difficulties including

lack of standardised resources despite progress. Teachers create materials of variable quality and consistency. Diverse schools require professional development and culturally appropriate teaching tools that are widely available and standardised.

Culturally responsive education literature promotes cultural relevance in instruction to improve learning results, which fits data. Culturally responsive education fosters belonging and confidence by supporting learners' identities and crosses cultural gaps, according to Gay (2019). According to Ladson-Billings (2021), culturally relevant teaching strategies boost learners' involvement. Local examples helped participants understand fractions and other mathematics topics, validating these claims.

Practice theory gaps are also found. Culturally responsive teaching requires institutional support like professional development and resources, according to Villegas and Lucas (2020). Participant concerns regarding limited training and resources suggest that while the theoretical framework encourages culturally responsive teaching, implementation requires systemic intervention.

Results suggest that Foundation Phase culturally sensitive mathematics training can change. Culturally familiar examples clarify concepts and boost interest in mathematics. However, resource restrictions and instructor unpreparedness limit these benefits. For fair implementation, culturally responsive teaching methods must be supported by focused educator training, multilingual and culturally suitable teaching materials, and policy support. Addressing these gaps can help culturally responsive teaching create inclusive and successful classrooms.

4.7.3 Sub-Theme 3: Application of Visual Aids, Manipulatives, and Real-Life Examples

Visual aids, manipulatives, and real-life examples boost learners' home-language math learning, according to interviews. Teachers say these tools help young children understand abstract topics. One teacher stated counting bottle caps boosted theoretical and practical understanding. Parents stated their learners were more engaged in mathematics since they could use it to share food or count household items. Departmental heads agreed culturally, and linguistically relevant examples made mathematics more meaningful.

Despite language barriers, mathematical manipulatives and visual aids help learners understand themes. This works with learners of different languages in varied contexts. Curriculum advisors said such methods promote variety and confidence, especially for language-challenged learners. However, resources and teacher training on integrating these tools into schools were inadequate.

Quoted Responses:

"When I used bottle caps to teach addition, the children immediately understood. They could see and touch what I was explaining, and it made a big difference." (Participant 2, Teacher)

"Using examples from everyday life, like dividing fruit, helps children connect math to their world. My daughter often comes home excited to tell me what she learned." (Participant 8, Parent)

"Visual aids like fraction charts are critical in multilingual classrooms. They allow learners to see the concept and understand it regardless of their home language." (Participant 3, Teacher)

"Children grasp multiplication faster when you relate it to planting rows in a garden, which they see at home. It's practical and memorable for them." (Participant 6, HOD)

"We find that manipulatives and real-life examples reduce the intimidation that math can bring. It builds confidence in learners who might otherwise be hesitant." (Participant 1, Curriculum Advisor)

According to the samples, Foundation Phase learners need visual, tactile, and contextual mathematics education. Hands-on research with bottle caps or food enhances Piagetian concrete operational thinking. Focusing on real-life circumstances reveals how culturally appropriate education increases comprehension and recall. Visualizing mathematical topics' applications motivates and inspires learners.

These techniques face systemic obstacles like teacher preparation and resource constraints. Teachers who make their own tools are innovative but may lower education quality. Effective teacher training was another topic. Curriculum advisors and HODs recommended policy support for standardised resources and training to promote school equity.

Studies show that visual tools and manipulatives assist early mathematics education. Tactile and visual materials in mathematics lectures improved conceptual knowledge and problem-solving, according to Reys et al. (2020). Real-life examples from learners' cultural and language backgrounds improve engagement and understanding, according to Boaler (2021).

Other researchers warn against manipulative overuse without instructional purposes. The technologies are effective but less successful without structured teacher support, according to Ball et al. (2019). Our findings corroborate participants' concerns about resource availability and teacher preparation, demonstrating a gap between theoretical benefits and practical implementation.

4.7.4 Sub-Theme 4: Collaboration with Parents and Community for Resource Development

Interviews showed that parents, teachers, and the community must collaborate on home language math tools. Parents asked schools to state home language mathematics training goals and rewards. Most participants requested more coordinated collaboration, while some schools invited parents to meetings or developed WhatsApp groups. Teachers claimed parents' help at home helped learners learn and practise mathematics. They saw inconsistent parental assistance and few home-language instruction resources. Curriculum advisors stressed community-driven efforts to provide culturally relevant teaching aids that reflect learners' reality. This strategy encourages Foundation Phase resource sharing for effective mathematics instruction.

Quoted Responses:

"Parents want to help, but they often feel left out. If we involve them in creating simple resources, they will understand better and support their children at home." (Participant 4, Teacher)

"I think the school should organize regular meetings where we, as parents, can give feedback and learn how to support this approach." (Participant 8, Parent)

"When the community contributes, such as donating posters in the home language or organizing learning events, it shows the learners that everyone values their education." (Participant 2, Curriculum Advisor)

"Some parents have shared creative ways they use everyday objects like mealie cobs to explain fractions at home. This is very encouraging because it builds on what we teach in class." (Participant 3, Head of Department)

"WhatsApp groups have helped us stay updated, but they're not enough. We need more face-to-face discussions to address challenges and create better teaching aids together." (Participant 7, Parent)

Results show that parent-community communication is appreciated but done differently. Teachers said supportive parents improved arithmetic confidence and comprehension. However, interviewers worried about unequal parental commitment, frequently caused by poverty or illiteracy. Curriculum advisers taught parents to make inexpensive teaching aids. The study also indicated that schools with WhatsApp groups or parent-teacher seminars had more community participation. Parents giving children home-language examples encouraged resource sharing and cultural pride in this collaborative atmosphere. Budget constraints and inconsistent school activities hindered coordination.

Findings support community education research. Epstein's (2019) parental involvement theory states that school-family support improves learners' outcomes outside the classroom. Active parental involvement boosts academic performance and self-efficacy, argues Desforges and Abouchaar (2021). Hornby (2020) revealed that socioeconomic gaps can prevent some families from participating in school activities, corroborating interviewees' resource-sharing and communication concerns.

It expands the literature by showing that community-generated, culturally relevant tools improve home-language mathematics learning. Mafu and Sithole (2023) discovered that local knowledge in teaching aids gives learners ownership and relevance. Spaull and Jansen (2022) urge policy-driven frameworks to standardise parental resource development, hence participants' concerns regarding systemic assistance.

These findings recommend a coordinated, holistic community involvement and structural support strategy. This implies family and community involvement in educational policies could improve home language mathematics instruction. Schools may provide a strong, culturally aware education by using community resources and encouraging open communication.

4.8 DISCUSSION OF THE FINDINGS

Theme 1: Improved Conceptual Understanding in Home Language Instruction

Learning mathematics in their own language consistently improved comprehension. Parents found learners comprehended things faster without having to translate English instructions cognitively. Participant 1 claimed Tshivenda helped their child grasp English instructions plainly. According to teachers, language familiarity helps learners focus on the material. Cummins' (2021) linguistic interdependence theory suggests that first-language cognitive development aids second-language learning.

Although teachers worried about native language resources, participants believed this strategy encouraged active engagement. Vygotsky's (1978) socio-cultural theory claims that language and culture instruction benefits learners. Multilingual classroom management requires training for teachers (Participant 4).

Theme 2: Enhanced Confidence and Participation

We also found that home-language mathematics sessions boost learners' confidence and participation. Participant 3 and other parents saw that their shy learners were more engaged in class. Teachers said this shift made learners more comfortable with problem-solving and collaboration. This improvement supports Alexander, (2021) self-determination theory, which highlights intrinsic motivation's autonomy and competence.

These findings confirm Probyn's (2019) finding that home-language instruction enhances learner self-esteem; however, several participants were concerned about transitioning to English in later grades. Progressive bilingual integration with English terminology and home language training helps transitions, according to Heugh et al. (2021).

Theme 3: Parental Involvement and Home-School Collaboration

Effective home-language instruction requires parental involvement. Participants 5 and others felt empowered to help their children with homework by knowing the language of instruction. This participation enhances home-school links, confirming Epstein's (2019) model of overlapping spheres of influence that family-school collaboration improves learners' achievement.

However, communication issues arose. Many participants suggested more parent-teacher meetings and WhatsApp groups. Eberly et al. (2022) observed that clear and consistent communication maintains parental involvement. Addressing these gaps could improve home-language instruction.

Theme 4: Challenges of Transitioning to English

Participants were divided on home-language instruction's long-term feasibility, notably the transfer to English in upper grades. Participant 7's parents were concerned that learners would struggle to learn English after being taught in their native language. Teachers emphasized dual-language resources and professional development to prepare learners for this transformation. According to Makalela (2020), such adjustments can create "academic language shock". Participants suggested adding English terms gradually and using bilingual materials, following Heugh et al.'s (2019) additive bilingualism strategy. Such solutions could limit interruptions while preserving home-language instruction's benefits.

4.9. THE STUDY ON THEORETICAL FRAMEWORK

This study of the effect of teaching mathematics in the home language in the Foundation Phase aligns closely with the sociocultural theory of Lev Vygotsky. Vygotsky's theory emphasizes the role of social interaction, cultural tools, and language in cognitive development, particularly in learning and problem-solving. This study align with the theory in the following ways;

4.9.1. Language as a Cultural Tool

Vygotsky argued that language is a primary tool for cognitive development. In the context of teaching mathematics in the home language, the study shows that children who learn in their home language are more likely to engage meaningfully with mathematical concepts because they can better understand the language used to explain abstract ideas, (Kiwanuka et al., 2023). Language in the home language enables learners to grasp mathematical reasoning in a more familiar and comprehensible manner.

4.9.2. Scaffolding and the Zone of Proximal Development (ZPD)

Vygotsky introduced the concept of the Zone of Proximal Development (ZPD), which refers to the difference between what a learner can do independently and what they can do with guidance from a more knowledgeable person, such as a teacher or peer,(Margolis, 2020). Teaching mathematics in the home language allows teachers to provide more effective scaffolding. When children understand the language of instruction, they can receive clearer explanations, prompts, and questions, which help them solve problems and advance in their learning within their ZPD. Teachers can scaffold learning in ways that are more attuned to learners' cognitive abilities in the home language, (Gehlot, 2021).

4.9.3. Social Interaction and Collaborative Learning

Vygotsky believed that social interaction is essential for learning. In the Foundation Phase, children are still developing their understanding of mathematical concepts, and working in their home language allows for richer social interactions. When children can communicate more easily in their home language, they are more likely to engage in collaborative activities, ask questions, and explain their thinking to others. This active participation in learning through social exchange helps to reinforce their mathematical understanding, (Rivera & Waxman, 2022).

4.9.4. Cultural Relevance and Meaning-Making

Vygotsky emphasized the importance of cultural context in learning. By teaching mathematics in the home language, Kim,(2020) stated that the teacher can

incorporate culturally relevant examples, metaphors, and teaching strategies that resonate with the learners' background. This connection to learners' lived experiences fosters better meaning-making and understanding. Learners are more likely to relate to mathematical concepts when they are able to engage with the material through the lens of their own cultural and linguistic frameworks.

4.9.5. Mediated Learning

Vygotsky believed that cognitive development is mediated through tools and signs, including language, which serve as bridges between the individual and the world, (Rivera & Waxman, 2022). Teaching mathematics in the home language acts as a mediating tool, allowing learners to internalize mathematical concepts more effectively. They can "think in" the home language and use it as a mental framework for understanding and solving problems, ultimately internalizing mathematical knowledge.

The alignment between teaching mathematics in the home language in the Foundation Phase and Vygotsky's sociocultural theory is clear. Vygotsky's theory underscores the importance of language, social interaction, and cultural context in learning. Using the home language as the medium of instruction in the foundation phase enhances cognitive development, facilitates social interactions, and provides learners with a more accessible and meaningful way to engage with mathematical concepts.

4.10 CONCLUSION

This chapter presents the data analysis from participant interviews, highlighting how home-language mathematics teaching enhances conceptual understanding, learner confidence, and parental involvement. It describes participants' demographics and organizes the data into four main themes and four subthemes per each main theme. The findings align with educational theories, showing that home-language instruction is effective. However, challenges such as transitioning to English and lack of standardized resources require focused interventions. The results emphasize the shared responsibility of teachers and policymakers in supporting home-language teaching. Addressing issues like teacher training, resource access, and family communication can improve learning outcomes. Despite its benefits, collaboration

among teachers, parents, and policymakers is needed to overcome challenges and sustain positive impacts.

The chapter also connects the findings to the sociocultural theory, which highlights the role of language, social interaction, and cultural context in learning. The next chapter will offer conclusions and recommendations based on the data analysed in this chapter.

CHAPTER 5: SUMMARY, CONCLUSIONS, RECOMMENDATIONS

5.1 INTRODUCTION

In Chapter 5, the main results, conclusions, and suggestions from the study are summed up. The study looked into what happens when you teach mathematics in learners' home language during their Foundation Phase. The point of this study was to find out how using home language affects how well learners understand, are interested in, and do in mathematics. At the start of the chapter, the study background, literature review, methodology, and detailed results from the previous chapters are summed up along with their most important findings. The study showed the good effects of home language teaching on learners' ability to understand and participate, as well as the problems that come up due to limited resources, inexperienced teachers, and worries from parents. The results show that teaching a language at home can help learners learn mathematics, but only if they have the right support systems in place, such as trained teachers, international materials, and community involvement. There are suggestions at the end of the chapter that can be used to make home language-based mathematics teaching better in schools.

5.2 SUMMARY

This study explored how using home language to teach mathematics in the Foundation Phase affects learners' understanding, participation, and academic performance. The research was conducted in selected schools in the Sibasa Circuit, Vhembe East District, Limpopo Province.

Chapter 1: Introduction and Background

Chapter 1 introduced the study by outlining the research problem, objectives, and key questions. It highlighted language barriers in South African classrooms, where the language of instruction often differs from learners' home language, making mathematical concepts difficult to grasp. The problem statement emphasized the need to investigate whether home language instruction improves comprehension and engagement. The chapter also presented the study's significance, theoretical framework, and key definitions.

Chapter 2: Literature Review

Chapter 2 reviewed relevant literature on the role of language in mathematics instruction. The study was guided by Vygotsky's Sociocultural Theory, which emphasizes the role of language and social interaction in learning. The literature review discussed multilingual education globally and in South Africa, highlighting the benefits of home language instruction, such as better conceptual understanding, and challenges, such as the lack of standardized terminology. It also examined educational policies, including the South African Language in Education Policy (LiEP), which supports home language instruction in the early grades.

Chapter 3: Research Methodology

Chapter 3 described the research methods used to examine the effects of home language instruction in mathematics. The study followed a qualitative research approach and a case study design to gain an in-depth understanding of participants' experiences. Data was collected through semi-structured interviews, classroom observations, and document analysis. The study targeted Foundation Phase Mathematics teachers, parents, departmental heads, and curriculum advisors in the Sibasa Circuit. Using purposive sampling, 32 participants were selected: 10 teachers, 15 parents, 5 departmental heads, and 2 curriculum advisors. The data was analysed using thematic analysis to identify patterns and themes. Ethical considerations, including informed consent, confidentiality, and voluntary participation, were upheld to ensure trustworthiness through credibility, transferability, dependability, and confirmability.

Chapter 4: Data Presentation and Findings

Chapter 4 presented the study's findings, highlighting both the benefits and challenges of home language instruction in mathematics. The results showed that learners demonstrated better engagement, improved problem-solving skills, and greater confidence when taught in their home language. Parents and teachers observed that children participated more actively in lessons. However, challenges included difficulties translating complex mathematical terms into the home language, a lack of standardized terminology, and teacher training gaps in bilingual instruction. Some educators also raised concerns about learners' transition to English-medium instruction in later grades.

The study found that home language instruction positively impacts mathematics learning in the Foundation Phase. However, it also recommended improvements, such as bilingual teaching strategies and professional development programs for teachers to enhance their ability to teach mathematics effectively in home languages.

5.3 INTERPRETATION OF FINDINGS/RESULTS

The results show that using home language when teaching mathematics makes learners much better at understanding concepts and participating in class activities. When learners were taught mathematics in their own language, they understood it better and were more willing to do problem-solving activities. Teachers saw that learners were talking to each other more and having more trust.

The study did, however, find some important problems. A lot of schools don't have the tools and help they need to do home language education well. As a result of their limited knowledge of the home language, some teachers were worried about how well they could teach mathematics. Parents had different thoughts. Some thought that using the home language might make it harder for their children to do well in areas where English is the main language.

Even with these problems, schools that put in place organised support programs like training for teachers and programs to get parents involved had better results. The results show that a well-organised and cooperative method is needed to get the most out of home language instruction in mathematics.

5.4 CONCLUSIONS

The study found that teaching mathematics in the home language improves academic achievement and engagement. A familiar language helps learners understand complicated mathematical topics and gain confidence. Home language instruction needs resources, instructor expertise, and parental support to succeed.

We conclude that Teachers, legislators, and parents must work together to provide home language education in mathematics. Clear rules and resources can assist in solving problems and improve Foundation Phase mathematical education.

5.5 RECOMMENDATIONS

5.5.1 Provision of Professional Development Programs for Teachers

Teachers need professional development to teach mathematics in their home languages. Multilingual teachers may struggle to balance mathematical and language instruction. Mphahlele et al. (2022) noted that many teachers don't speak African languages, making teaching arithmetic in learners' home languages difficult. Dlamini and Essien (2023) argue teacher preparation should incorporate language skills and multilingual class management. These programs must examine how language and math interact to ensure teachers can accurately convey mathematical concepts and ideas. Peng et al. (2020) emphasise that mathematical thinking is tightly linked to language. Therefore, good language skills are necessary for grasping concepts. According to Adler (2021), professional development must be adapted to teachers' and learners' language and culture to be effective.

Professional development should include language learning and learner-engaged teaching methods. According to Robertson and Graven (2020), Teachers should be trained in engaging, culturally sensitive approaches that are similar to how they teach their own language. According to Nahole and Haimbodi (2022), training programs should incorporate collaborative workshops and peer coaching so Teachers may exchange best practices and solve difficulties together. Teacher training should incorporate exams and feedback, according to Essien (2020), so we can understand how professional development affects the classroom. These initiatives promote lifelong learning to help teachers meet learners' evolving needs. A language, pedagogy, and cultural awareness professional development technique is needed to improve the Foundation Phase of mathematical education.

5.5.2 Development and Distribution of Instructional Materials

For bilingual mathematics training, home-language teaching materials are a must. When teachers don't have the right tools, they have to improvise, which leads to inconsistent mathematics lessons. Mphahlele et al. (2022) say home language learning is slowed by the lack of standardised tools in African languages. Robertson and

Graven (2020) say that resources need to be accurate in terms of language use and aligned with the curriculum to be clear and consistent. Dlamini and Essien (2023) also suggest tools that are available in more than one language and make it easy for learners to switch between English and their home language languages. This two-language approach helps children understand ideas better and calms their parents' worries that learning a language at home will hurt their English skills.

Digital materials also help close the gap in teaching resources. Peng et al. (2020) say that interactive digital platforms make learning fun and allow for more personalised teaching. Nahole and Haimbodi (2022) say that schools that don't have a lot of resources can use e-learning tools to teach local languages. Policymakers, partners in the business world, and translators can work together to make and share these tools. Essien (2020) stresses working together to create material that is both linguistically and educationally sound. By working together and using technology, policymakers can get rid of the unfair distribution of resources and give all children high-quality school supplies.

5.5.3 Encouraging Parental Involvement in Learners' Education

Parental involvement is crucial to mathematics home language training. Parents' involvement in their children's education helps them remember schoolwork, making the classroom more coherent. How parents feel about home language education affects how motivated and successful their children are as language learners, according to Dlamini and Essien (2023). Mtshali and Mashiya (2022) say that schools should get parents involved by having workshops and meetings where they talk about good ways to learn a language at home and give mathematics tips. These programs are very important in places where people speak more than one language, according to Robertson and Graven (2020). This is because parents may be worried about how teaching a language at home will affect their child's schoolwork. By pushing parents and children to talk and work together, schools can deal with these problems and help parents get along with their children.

Schools train and give parents tools to help their children learn at home. Nahole and Haimbodi (2022) say that language tools can help parents help their children learn and grow. What Mtshali and Mashiya (2022) say is that you should do simple activities at

home that connect what you learn in school. Moms and dads can use words their children already know to help their children remember mathematics. Malindi et al. (2023) say that parents should be given the information and tools they need to help their children with their schoolwork. Schools help learners do well by making them feel supported, and letting parents be a part of the learning process improves the bond between school and home.

5.5.4 Building Partnerships with Community Organizations

Community groups can assist schools in using home language languages. Cultural groups and NGOs can offer schools with home language teaching resources and information. State community groups encourage several languages and provide local resources (Robertson and Graven, 2020). Dlamini and Essien (2023) say partnerships can produce extracurricular events and seminars that improve classroom learning. These methods boost learners' engagement and community knowledge of home language mathematics.

When schools lack funding, community partnerships can help. Community groups have the money and networks to develop and distribute instructional materials (Nahole & Haimbodi, 2022). Mphahlele et al. (2022) advise public education. Essien (2020) suggests schools work with ethnic groups to produce culturally relevant mathematics tools. Schools can support home language Mathematics by building community linkages.

5.5.5 Further Research on Best Practices

Better ways to teach language and mathematics at home need to be looked into more. New studies on how to teach can help us teach mathematics and language at home simultaneously. Peng et al. (2020) say it's important to know how language affects mathematics thinking and how the words learners use affect how well they understand. Nahole and Haimbodi (2022) say that more long-term research is needed to determine how teaching a language at home changes learners' performance in school and mental growth. By comparing studies, Robertson and Graven (2020) say that we can learn how to teach a language at home in different settings. This could make routines bigger and more adaptable.

It's important to look into how computers and other tech can help people learn languages at home. Dlamini and Essien (2023) say that we need to learn more about how to use technology to teach mathematics in schools that don't have a lot of tools. A 2020 article by Essien talks about how mathematics could be more fun if learners could use their own languages in video games. Researchers need to do more work in these areas so that we can make rules and programs that are based on facts and help with home language and mathematics lessons. This way, every kid can do well.

5.6 LIMITATIONS OF THE STUDY

5.6.1 Time Constraints

Time constraints limited this study's scope and depth. It was difficult to study rural and urban schools due to a lack of time to gather and analyse data. Multilingual education studies generally lack time to collect and assess data, according to Mphahlele et al. (2022). Like Dlamini and Essien (2023), academics may not have enough time to investigate the complex relationship between language and numbers adequately. Time constraints can delay language-responsive technique planning, according to Mtshali and Mashiya (2022). A well-structured timeline ordered important tasks, although teacher training and parental input were limited. Future studies should study the challenges of home language mathematics education across longer time frames.

5.6.2 Workload

It was hard for me to balance my schoolwork and this study project. This problem got worse because the study had many parts and needed a lot of data collection, research, and reporting. Robertson and Graven (2020) say that planning and carrying out language and mathematics lessons in a variety of linguistic and social settings should be done with care. Researchers have more work to do, say Nahole and Haimbodi (2022), because studying bilingual education means studying both language and teaching. Peng et al. (2020) say that problems with workload can lower the quality of research, especially when researchers have to balance work with personal obligations. This problem was fixed by breaking up the work into manageable chunks, which made the study better. However, a separate study team with clear roles could make this easier in the future, focussing and deepening the analysis.

5.6.3 Financial Constraints

The study couldn't go to many schools since they didn't have enough money, especially in rural or poorly developed areas. Mphahlele et al. (2022) say that cash constraints can make expanding studies in African language education hard. Essien (2020) says that researchers may not be able to use in-depth interviews and longitudinal studies since they are too expensive. These methods are needed for more complex results. Malindi et al. (2023) say that virtual technologies may not be able to replace getting data in person, but they can help make up for limited budgets. Virtual surveys and conversations were used in this study to keep the cost of gathering data low. This approach worked well, but in the future, researchers should look for ways to work together to raise money for bigger, more inclusive studies.

5.6.4 Family Responsibilities

The researcher struggled to allocate time to the study due to personal obligations. According to Dlamini and Essien (2023), balancing family and schooling sometimes hampered research plans. They emphasise time management during learning. Personal obligations can impair study quality, especially during data collection and analysis, according to Mabele and Pule (2023). Mtshali and Mashiya (2022) suggest that family and institutional support can assist researchers to focus on their academic aims. This study found that meticulous planning and family help met all these demands. However, institutional support systems like flexible timetables and research assistants may make studying easier in the future for persons with personal obligations.

5.6.5 Methodological Challenges

A problem with the way this study was done was that it didn't have a representative group. Mphahlele et al. (2022) say that conscious sampling is needed but that the different linguistic and socioeconomic situations in South Africa may make it harder to generalise. Robertson and Graven (2020) say that a study on multilingual education needs a representative sample that shows a range of learner groups. Nahole and Haimbodi (2022) say that the methodological problems in bilingual studies come from trying to find a balance between the different languages and the practicalities of the study. Purposive picking made sure that the right people were included in the study,

but the lack of randomisation made it harder to draw broad conclusions. Mixed-methods techniques that include quantitative and qualitative data should be used in future research to make it more reliable and representative.

5.6.6 Sample Population

The study's sample group didn't represent many schools, which may have limited its applicability. Mphahlele et al. (2022) recommend incorporating schools from varied socioeconomic backgrounds to study how home language teaching affects children. Dlamini and Essien (2023) argue that urban and rural schools encounter different challenges when teaching multiple languages. A complete study requires a varied sample. Socioeconomic issues affect tools and teacher preparation, which affects home language instruction. Even though persons from different socioeconomic backgrounds were tried to be included, the sample's inadequacies demonstrate that future studies need larger sampling. This strategy would help us study how home language teaching affects mathematics learning in more school settings.

5.7 AREAS OF FUTURE RESEARCH

In the future, researchers should investigate how learning a language at home affects math skills in higher schools. Mphahlele et al. (2022) show that comprehension and interest improve in the Foundation Phase. However, there isn't a lot of information on whether these improvements lead to better grades in later stages. Mabele and Pule (2023) say that switching from home language teaching to English in later grades could make it harder to learn mathematics, especially for learners who speak different languages. Govender and Hugo (2020) say that knowledge gaps may appear as learners get used to new terms and teaching methods. Dreyer and Mawela (2020) suggest long-term studies to find out how early home language learning changes cognitive development and math problem-solving. These studies would show how effective home language training is as a base for long-term academic success. This information would be used to make policies that help learners throughout their education.

Another thing that people are interested in is finding effective ways to teach mathematics that combine learning English at home with learning mathematics. This two-language method might help children get better at mathematics and English,

which raises concerns that only learning one language at home might limit their future choices. Malindi et al. (2023) say that code-switching can help people move between languages more easily by filling in holes in language and thought. Norén and Caligari (2020) say that digital tools and bilingual worksheets can help learners connect their home language to English. Mbhiza et al. (2024) say that mathematics can be more interesting if it is taught with examples that are important to both languages and cultures. However, Dreyer and Mawela (2020) say that these methods will only work if teachers speak both languages and make sure that the demands on language and ideas are balanced. Researchers should examine the effects of these tactics on learners' performance in different schools.

The long-term viability of home language Mathematics is another major issue for teachers and parents. Teachers enforce language standards, but competency and resource affect their views on home language learning. Mphahlele et al. (2022) report that a lack of professional development and standardised resources worries indigenous language Teachers about teaching mathematics. Parental hopes for their children's academic and professional achievement shape their attitudes. Some parents teach their children English because they believe teaching a second language hurts global competition, according to Govender and Hugo (2020). Malindi et al. (2023) recommend workshops and group projects to help parents overcome these biases and improve language acquisition at home. This study may illuminate longevity difficulties and show stakeholders how to support home language education.

Another exciting topic is how digital learning aids supplement home language and mathematics lessons. Digital technology can replenish educational resources and interest learners. E-learning tools can help learners learn mathematics in their preferred language, according to Mbhiza et al. (2024). Videos and models ease complicated mathematical concepts, say Norén and Caligari (2020). Pule (2020) says digital tools can help teachers with lesson ideas and multilingual materials. To work, these solutions must address rural technology access and local content. Examine digital learning tools to see how they affect learners' engagement and accomplishment and whether they can close the education gap between cities and rural areas.

Urban and rural school comparisons show how outside circumstances affect home language mathematical teaching. Rural schools may struggle with home language

policy due to teacher shortages and resources. Mphahlele et al. (2022) that rural learners can lag behind urban learners due to these inequities. Malindi et al. (2023) think understanding these differences helps you respond appropriately. Even though urban schools have many resources, Dreyer and Mawela (2020) suggest that linguistic variety and classroom size may be difficult. Comparative research can help you teach mathematics and create inclusive norms. These findings could aid training and resource planning in diverse schools.

Also important is how culture affects home language mathematics instruction. Cultural ideas about education and community influence math involvement, especially when taught in their own language. Mbhiza et al. (2024) recommend motivating and teaching mathematics with culturally relevant examples and activities. Pule (2020) believes multilingual lessons must be culturally relevant because learners' identities and experiences are rooted in their languages. Govender and Hugo (2020) suggest that cultural factors like parents and teachers preferring English for money can be difficult. Malindi et al. (2023) that communities collaborate to develop and implement culturally sensitive training to address these concerns. This study could show how national backgrounds and language patterns affect learners' performance, making mathematics instruction easier and more effective.

5.8 CONCLUSION

The study shows that teaching mathematics in the original language of learners makes them do better in school. Learners understood mathematics better and felt more confident in their problem-solving skills when taught in their home language. The lack of equipment, inexperienced teachers, and apprehensive parents must be addressed for home language education to succeed. Home language instruction works best with trained teachers, multilingual resources, and interested parents. Teachers, politicians, and the community must collaborate to solve challenges and improve Foundation Phase mathematics education.

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7. APPENDICES/ANNEXURES

7.1. Appendix A1 (Ethical Clearance UHDC)

ETHICS APPROVAL CERTIFICATE

RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Mr L Randima

STUDENT NO:
15002075

PROJECT TITLE: **The effects of teaching mathematics using home language in Foundation Phase.**

ETHICAL CLEARANCE NO: FHSSE/24/ECE/04/1610

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Dr MG Sikhwari	UNIVEN, Early Childhood Education	Supervisor
Mr L Randima	UNIVEN, Early Childhood Education	Investigator-Students

Type: Masters Research
Risk: *Minimal risk to humans, animals or environment (Category 2)*
Approval Period: October 2024 – October 2025

The Research Ethics Social Sciences Committee (RESSC) hereby approves your project as indicated above.

General Conditions
While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following.

- The project leader (principal investigator) must report in the prescribed format to the REC:
  - Annually (or as otherwise requested) on the progress of the project, and upon completion of the project.
  - Within 48hrs in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.
  - Annually a number of projects may be randomly selected for an external audit.
- The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the REC. Would there be deviated from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.
- The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date; a new application must be made to the REC and new approval received before or on the expiry date.
- In the interest of ethical responsibility, the REC retains the right to:
  - Request access to any information or data at any time during the course or after completion of the project,
  - To ask further questions; Seek additional information; Require further modification or monitor the conduct of your research or the informed consent process.
  - withdraw or postpone approval if:
  - Any unethical principles or practices of the project are revealed or suspected.
  - It becomes apparent that any relevant information was withheld from the REC or that information has been false or misrepresented.
  - The required annual report and reporting of adverse events was not done timely and accurately,
  - New institutional rules, national legislation or international conventions A it necessary

ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE
Date Considered: October 2024

Name of the RESSC Chairperson of the Committee: Prof M. Mwale-Manjoro

Signature.....

UNIVERSITY OF VENDA
OFFICE OF THE DIRECTOR
RESEARCH AND INNOVATION
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Appendix A2 (Ethical Clearance Department of Education)

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Ref: 2/2/2 Enq: Makola MC Tel No: 015 290 9448 E-mail:MakolaMC@edu.limpopo.gov.za
Randima L

PO BOX 311
Makonde
0984

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH

1. The above bears reference.
2. The Department wishes to inform you that your request to conduct research has been approved. Topic of the research proposal: **"The effects of teaching mathematics using home language** in **Foundation Phase."**

3. The following conditions should be considered:

3.1 The research should not have any financial implications for Limpopo Department of Education.

3.2 Arrangements should be made with the District or Circuit Office and the School concerned.

3.3 The conduct of research should not in anyhow disrupt the academic programs at the schools.

3.4 The research should not be conducted during the time of Examinations especially the fourth term.

3.5 During the study, applicable research ethics should be adhered to; in particular the principle of voluntary participation {the people involved should be respected).

3.6 Upon completion of research study, the researcher shall share the final product of the research with the Department.

Cnr 113 Biccard & 24 Excelsior Street, POLOKWANE, 0700, Private Bag X 9489, Polokwane, 0700
Tel:015 290 7600/ 7702 Fax 086 218 0560

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4 Furthermore, you are expected to produce this letter at Schools/ Offices where you intend conducting your research as an evidence that you are permitted to conduct the research.

5 The department appreciates the contribution that you wish to make and wishes you success in your investigation.

Best wishes.

01/2025

Makola MC (Ph.D) **Date**

Director: Integrated Planning, Research & Reporting

Mr. Molope NM

01/2025

Date

Mr. Molo e NM

ACTING DDG: CORPORATE SERVICES

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7.2. Appendix B (Turnitin report)

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Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

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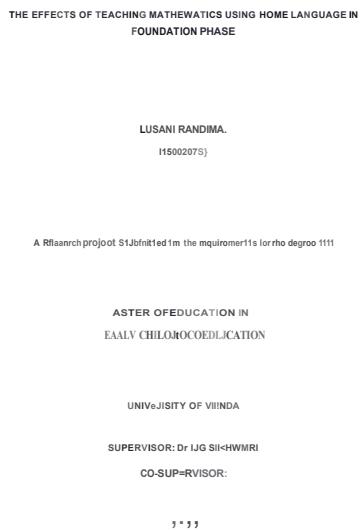

THE EFFECTS OF TEACHING MATHEWATICS USING HOME LANGUAGE IN FOUNDATION PHASE

LUSANI RANDIMA.

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Editorial letter

This serves to confirm that I, Dr. TE Sikitime, attached to the University of Venda, Department of English Media Studies and Linguistics, have proofread a proposal titled:

THE EFFECTS OF TEACHING MATHEMATICS USING HOME LANGUAGE IN FOUNDATION PHASE

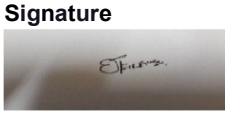
BY

LUSANI RANDIMA

(15002075)

Editorial work focused mainly on technical precision and common errors relating to syntax, diction, word order, and formulation of ideas. Corrections and suggestions were made for the student to effect before submission.

Signature **Date 11 January 2025**



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