



**Teaching mathematics to isiZulu home language
speakers in rural high schools: A study of teachers'
experiences**

by

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DECLARATION

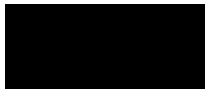
I, Sifiso Phoswa, declare that this report entitled, *Teaching mathematics to isiZulu home language speakers in rurals: A study of teachers' experiences* is my own original work except where I have explicitly indicated otherwise. I also declare that this research report has not been submitted before, in part or in full, for any degree or examination to any other university.



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Date: Thursday, 09 June, 2023



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Date Thursday, 09 June, 2023

DEDICATION

Ngibonga umama wami uSabani Madlala ukungibeka emithandazweni nangothando anginika lona. Ngiphinde ngibonge kubantwana bami ngokungibezelela kuleminyaka emibili edlule ngibambekile ngomsebenzi nalolucwaningo. Okokugcina, ngithanda ukunikela ngalolucwaningo kubaba wami ongasekho emhlabeni, okunguye owatshala imbewu yokuthanda imfundo esaqhuma namanje, owayeluleka athi 'mina anginalutho, ifa lenu imfundo'. UNkulunkulu umnikazi wamandla wonke, ngibonga uthando nokungiqinisa njalo.

I would like to thank my mother, Sabani Madlala for her prayers and everlasting love. I also would like to thank my children for understanding that my absence in the past two years was because of juggling work with studying. Lastly, I would like to dedicate this project to my late father, Sinothi Madlala, whose love for education continues to inspire my efforts, as he used to say, 'I have no estate, your inheritance is your education'. To God Almighty, thank you for the love and comfort.

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ABSTRACT

Teaching mathematics in Ndwedwe, a rural area of KwaZulu-Natal where most learners are isiZulu home language speakers is investigated through the experiences of three mathematics teachers teaching in rural high schools located in the ILembe district. Understanding the teaching experiences of an abstract subject such as mathematics, this study attempts to respond to the main research question; what teacher experiences of teaching mathematics to isiZulu home language speakers are, and the subsidiary question of how teachers' experiences assist in teaching learners for understanding in rural high schools. The study adopts Phenomenology as a methodology, and uses Interpretative Phenomenological Analysis as a methodological framework for handling and analysis of data, gathered from interviews and lesson observations. The findings of the study indicate that isiZulu is preferred by learners as they engage in classroom discussions, the learners are affected by their unsupportive backgrounds. To address learner challenges, teachers devise strategies to circumvent the adverse implications at school, which includes adapted teaching strategies, motivation, and creating additional time for learners to learn at school. In the study's investigation of teachers' experiences, it was revealed that mathematical language is a standalone language that is not dependent on either isiZulu or English, moreover, the teachers were shown to be central to the design of lessons despite resource challenges.

KEYWORDS: Mathematics, isiZulu, English, language, teacher, experience

List of Abbreviations and Acronyms

UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNICEF	United Nations International Children's Emergency Fund
IPA	Interpretative Phenomenological Analysis
ATP	Annual Teaching Plan
DBE	Department of Basic Education
Sd	Structural description
PanSALB	Pan South African Languages Board
SASA	South African Schools Act

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CHAPTER ONE

INTRODUCTION

1.1 Overview of chapter

This chapter outlines the background, context and purpose of the study on teachers' experiences with teaching mathematics to isiZulu home language speakers in a rural high school. Furthermore, this chapter will provide the significance and scope of the study, followed by the definition of terms employed in this study. Lastly, an outline of chapters is made by following the chronological sequence they are to be presented in for this dissertation.

1.2 Background of the study

Language plays an important role in the teaching and learning process. In South Africa, the majority of learners are English second and some are even third language speakers an official language of learning adopted by most schools. Language is an important resource for the successful advancement of mathematics learning; however, it can also act as a barrier to learning where the language of instruction is not the home language of learners (Phakeng, 2018; Martinez & Castro, 2013; Je Cho, 2015; Setati, Molefe & Langa, 2008). Learners' main language of learning plays a major role in their academic performance. Setati, Venkat, Adler, Rollnick and Vhurumuku (2009) note that although English enjoys preference over other languages as a medium of instruction in schools, it is 'not an equitably available and developed resource for learning mathematics for most South African learners (p. 9).

In South Africa, majority of learners are isiZulu home language speakers, despite this fact, the language(s) of learning for high schools across the country are English and Afrikaans, this reality sees a greater number of learners writing their grade 12 examinations in their second or third language (Department of Basic Education, 2010). Many scholars posit that language is a powerful tool within which thought processes and learning takes place. A plethora of studies have found that learning in ones' home language yields satisfactory learning outcomes, this is evident in studies conducted on the performance of learners whose home language is the language of

teaching and learning, they outperform their counterparts who do not learn in their home language, here, the argument presented is based on learners' familiarity with the language of teaching and learning (Robertson and Graven, 2019; Erath, Prediger, Quasthoff & Heller, 2018; Botes & Mji, 2010).

Supporting a view for learners to learn in their home language, Stein (2017) reports that a learner whose home language is different from the language of teaching and learning at school is required to first understand their second or third language used to learn and also make sense of the mathematics, which presents an additional learning stress for learners. An observation by Cummins (as cited in Maluleka, 2019) found that learners learn best when the language of teaching and learning is the same as their home language. The reason advanced for this is that learners are able to use the language of teaching and learning to help them understand the concepts as they use the language to express ideas and/or enrich their knowledge capacity through engagements.

A Working Paper by the International Monetary Fund presents an analysis of South Africa's position when compared with other countries on mathematical proficiency, it places South Africa at the tail end of the list when learners' results are compared to learners in equivalent grades in other countries (Mlachila & Moeletsi, 2019). In rural areas of KwaZulu-Natal, the most spoken language is isiZulu, a home language of majority of learners in rural areas, with English as the official language of teaching and learning in schools. The difference between the home language and school language for majority of the learners in rural areas present a question of how language should be used as a resource for access to education in these contexts. As the country grapples with poor world rankings in mathematics and sciences, the experiences of teachers teaching mathematics in rural schools hold the potential to add a crucial voice to how mathematics is learned in their contexts, and thus provide valuable teaching and learning insights that can be used improve the country's global ranking on mathematics.

1.3 Rationale for the study

Language is a critical component of learning, and many studies suggest that lack of adequate exposure and proficiency in the language of learning affects the learner's ability to learn and perform (Department of Basic education, 2010). In South Africa,

90% of learners in schools learn in a language that is not their home language (Tshuma and Cordeur, 2019). Studies on the effect of language on mathematics learning tend to focus on multilingual contexts, and less known on how teaching and learning occurs in schools where all learners share a home language that is not the official teaching and learning language of their school. Scholarly insights on how mathematics classroom engagements are facilitated with isiZulu home language learners hold the potential to shed light on the role of language in the teaching and learning of mathematics for learners in a rural school. Such an awareness of how language is used in the classroom can help inform the limitations and opportunities language offers to effective learning in isiZulu home language schools.

As teachers are responsible for facilitating learning in the classroom, Tshuma and Cordeur (2019) posit that 'a mathematics teacher who is not competent in the language of instruction faces challenges in imparting mathematical concepts and procedures' (p. 108). Teaching of mathematical language well is a prerogative of the teacher, and the quality of instruction in the classroom depends on the teacher's mastery of the language of instruction. A conversation I had with fellow mathematics education students when I was doing my undergraduate studies revealed to me that their high school mathematics and sciences education was almost entirely taught using isiZulu. This stimulated my curiosity as I had not undergone the same experience and was amazed at how most of them had achieved high grades for the subjects and maintained their competence. It became evident in our engagements that it was the teacher who was central to their understanding by simplifying the complexities of mathematics in a language that they could understand.

Given that majority of learners in rural areas have limited exposure to the English language, some teachers have adopted innovative language uses such as code switching and translanguaging to accommodate and bridge the language gap (Department of Basic Education, 2018). This has seen some of the rural schools compete, and in some instances learners from these rural schools outperform their counterparts' attending schools located in urban areas with presumably better access to English, the official language of teaching and learning. It is for this reason that the language experiences of teacher, when teaching isiZulu home language speakers, can provide valuable lessons for teaching mathematics to English second language speakers. Moreover, the language challenge remains relevant today as many learners

whose home language is not the language of learning continue to struggle with mathematics.

It is hoped that this study will report on teachers' experiences with teaching in rural high schools and share on what constitutes their teaching of mathematics for understanding within their contexts. The findings of the study are expected to provide valuable lessons for other teachers in similar context teaching mathematics.

1.4 Context of the study

The present study is conducted within research sites of three schools in the ILembe District, all located within Ndwedwe, a rural area located in the province of KwaZulu-Natal. All the schools selected for this study have isiZulu as a home language and English as a first additional language. All learners at these schools reside within the rural community and are isiZulu home language speakers. Similarly, mathematics teachers at the research sites are isiZulu home language speakers, although one of these three participating teachers does not reside within the area. The purpose of this study is to explore the experiences of mathematics teachers teaching in the context just described.

1.5 The learning of mathematics for understanding

A TIMSS Working paper series investigating the relationship between instructional clarity of a teacher and the mathematics achievement by learners indicated directly proportional results, which meant that improved instructional clarity resulted in better achievements in mathematical outcomes by learners (Fadji, 2022). Supporting the idea of instructional clarity by mathematics teachers towards training learners to understand the discipline, Kilpatrick, Swafford and Findell (2001) argue for instruction that 'focuses on important mathematical content, represented and developed with integrity' (p. 315). Furthermore, Brahier (2020) advocates for creating a culture of communicating mathematical ideas in the classroom, such communication is stimulated by the teacher's questioning style, probing learners enables them to precisely defend their mathematical statements through clear verbal explanation and description of solutions strategies that lead to the final answer.

A learning principle essential to the acquisition of school mathematics learning for understanding by learners requires the incorporation of their experiences and prior knowledge. The critical competencies for learning mathematics for understanding demand the development of conceptual understanding and procedural mastery in solving mathematical problems (Stylianides & Stylianides, 2007). To help learners achieve better learning outcomes in the subject, mathematics teachers are advised to focus on the mathematics during their facilitation of mathematics learning, do so while appreciating the fact that all learning occurs through language. This means that learners must be allowed to grapple with mathematics concepts and procedures using English and their home language as they engage with the subject learning for understanding, has been reported to have learning benefits for learners (Department of Basic Education, 2018).

The Department of Basic Education presented a mathematics teaching and learning framework for South Africa with a sole objective of fostering mathematics teaching for understanding adopts Kilpatrick's five strands of mathematical proficiency. The framework advocates for the adaptation of the five strands to the South African context, namely; mathematics teaching for conceptual understanding, development of learners procedural fluency in solving maths problems with accuracy and efficiency, inculcation of learners strategic competence on deciding on the most appropriate approach to solving a maths problem, creating the setting for learners to develop mathematical reasoning capacity in their logical engagement with mathematics, and the creation of a learning centred setting within the classroom in order to promote the development of all the strands as they are interwoven to produce a mathematically proficient learner (Department of Basic Education, 2018).

The development of learners' mathematical proficiency is dependent on effectiveness of classroom teaching, the capability and skills of a teacher to effectively teach mathematics is dependent on their attitude towards ongoing development on teaching strategies that produce results (Kilpatrick, Swafford & Findell, 2001). The outcomes of teaching mathematics diligently are observed in learners' demonstration of subject mastery through logically defending their solutions or mathematical routes to resolving a mathematics problem. Mathematical reasoning is a critical skill that must be encouraged in every learner, daily in a mathematics classroom. Teaching learners to reason mathematically can be achieved through posing 'why' and 'how' questions to

a learner's mathematical contribution, such follow up questions where a learner is expected to justify their reasoning are necessary whether their responses are correct or wrong (Brahier, 2020).

When mathematics learners come to class, their learning mathematics for understanding is dependent on many factors, according to Kilpatrick, Swafford and Findell (2001, p. 9):

The quality of instruction also depends on how students engage with learning tasks. Students must link their informal knowledge and experience to mathematical abstractions. Manipulatives (physical objects used to represent mathematical ideas), when used well, can provide such links. The use of calculators can enhance students' conceptual understanding, and practice can help them make automatic those procedures they understand.

1.6 Objectives of the study

The aim of this study is to understand mathematics teachers' experiences in teaching the subject to isiZulu home language learners in a rural context. Through observed and shared experiences, a report on how teachers' experiences assist in the teaching of mathematics to isiZulu home language speakers in rural high schools will be provided.

In pursuing this aim, I formulated the following objectives:

- 1.6.1 To understand teachers' experiences in teaching mathematics to isiZulu home language speakers' in rural high schools.
- 1.6.2 To understand the how teachers' language experiences assist in teaching mathematics to isiZulu home language speakers for understanding in rural high school.

1.7 Research questions

The study will be guided by the following overarching question:

What are teachers' experiences in teaching mathematics to isiZulu home language speakers in rural areas promote mathematical understanding?

The following are two critical questions:

- 1.7.1 What are teachers' experiences in teaching mathematics in isiZulu home language speakers' in rural high schools?

1.7.2 How do teachers' language experiences assist in the teaching of mathematics to isiZulu home language speakers for understanding in rural high schools?

1.8 Significance of the study

South Africa is a country with eleven official languages with sign language as the twelfth. According to the United Nations Educational, Scientific and Cultural Organisation -UNESCO (Bell, 2010), many learners in African countries use a foreign language as a medium of instruction in schools, their language of education in schools is often an official language that they do not use in their daily lives. The South African context is no different from the African reality, as isiZulu and IsiXhosa are the home languages of the majority of learners in the country, despite this fact, 'the majority of learners do not learn in their home language from grade four onwards' (Department of Basic Education, 2010, p. 29). The latter reality is despite the provisions of the Pan South African Language Board (PanSALB) Act of 1995, calling for the recognition and advancement of previously marginalised indigenous languages. However, English still enjoys much preference as an official language of teaching and learning in high schools.

Considerable power to choose language is given by a number of policies concerned with language rights in South Africa. The Bill of Rights, Section 29(2) guarantees everyone the right to enjoy education in the language of their choice in public institutions where that education is reasonably practicable (Constitution of the Republic of South Africa, 1996, Act no. 108). This guarantee by the Bill of Rights provides for the Minister of Education to establish norms and standards for public schools' language policy. Moreover, the power to determine the language policy in a school also rests with the School Governing Body (SGB) in public schools (South African Schools Act 84, 1996). While language policies in existence allow for language preference, Heugh (as cited in Trudell, 2016) observed that 78 percent of learners, who have indigenous languages as their home language, switch to learning with English after grade 3. The latter is a reality for English second language speakers, while their English and Afrikaans counterparts continue to benefit by learning in their mother tongue, a colonial and apartheid era advantage the majority of learners do not enjoy (Robertson & Graven, 2019).

Language preference and its use to facilitate learning in the classroom are important factors as success and disempowerment of pupils relies on its use. If classroom language is different from a learner's home language, the language experience in a classroom creates a reality that threatens the relevance of education (Bell, 2010). In the case of South Africa, black learners lack the necessary support mechanisms to develop their English language proficiency, a deficiency disadvantaging mostly rural black learners (Tshotsho, 2013). According to Trudell (2016), an online and blended Pan-African independent, recognised university, recent research on the language of learning indicates that South African learners whose language of learning was not their home language were struggling in school. This reality is set to place the black learner at the bottom of knowledge acquisition against their English and Afrikaans home language counterparts.

A considerable amount of research has been done on the importance and effect that the language of teaching and learning has on the acquisition of education by learners (Robertson & Graven, 2019; du Plessis & Mestry, 2019; Maluleke, 2019). However, it appears that very little or no scholarly literature has investigated the experiences of teachers teaching mathematics to isiZulu home language learners in rural context, given the presumption of limited access to the official language of teaching and learning. In conducting this study, an exploration of teachers' experiences with isiZulu home language learners will be made and an understanding of how their language experiences with their learners influence their teaching to promote mathematical understanding.

1.9 Scope of the study

A lot of research has been conducted on both nationally and internationally on the impact language of learning has on the education of learners whose home language is different from the language of teaching and learning. The teaching of learners in contexts where their home language is different from the official language of learning requires the teacher to bridge the gap that language may have. It is the experiences of teachers teaching in these contexts that language has an influence on their classroom instruction in facilitating the learning of mathematics for understanding. This study is conducted on the experiences of three teachers teaching mathematics

to isiZulu home language speakers in three schools located in a rural area of Ndwedwe. A detailed description of the research participants is found in chapter 3.

1.10 Definition of key terms

Providing definitions for key terms used in this study is important as different terms can have different meanings for readers depending on their contexts. To avoid the potential for misinterpretation borne from varying meanings of the same term use in different contexts, the key terms used in the title of this study are defined as follows:

IsiZulu is a language widely spoken all over South Africa, with about 25% speaking the language nationally, and 80% in the province of KwaZulu-Natal (Ndimande-Hlengwa, Mazibuko, Gordon, 2010).

Mathematics is defined as ‘a language that makes use of symbols and notations for describing numerical, geometric and graphical relationships.’ (Department of Basic Education, 2011, p. 8)

Teaching is ‘an interactive process, primarily involving classroom talk which takes place between teacher and pupil and occurs during certain definable activities’ (Rajagopalan, 2019, p. 6).

Teacher is defined as a ‘school-based educator whose core responsibility is that of classroom teaching at a school.’ (Rural Education Draft Policy, 2017, p. 7).

Understanding is defined as ‘a students’ grasp of fundamental mathematical ideas. Students with understanding know more than isolated facts and procedures’ (Department of Basic Education, 2018). A discussion on the meaning of understanding mathematics is presented in subsection 1.5 of this chapter.

Home Language refers to the ‘language that is spoken most frequently at home by the learner.’ (Rural Education Draft Policy, 2017, p. 5)

Rural High School is a secondary school offering grade 8 to grade 12 located in a ‘traditional areas characterized by low population densities, low levels of economic activity and low levels of infrastructure’ (Rural Education Draft Policy, 2017, p. 6).

Experience in the words of Forlizzi ‘is created through the interaction of an organism with its environment’ (1997, p. 11). For the purposes of the study,

an adopted meaning of experience is a set of subjective interpretation and meaning made from an interaction with the environment.

1.11 Outline of dissertation chapters

In determining the structure of this dissertation, this subsection provides a synopsis of each of the five chapters. These chapters are presented in a chronological order as follows:

Chapter One: Introduction

The first chapter provides a brief overview of the chapter, followed by the background of the study, the problem statement for this dissertation, the rationale for conducting this research, the context within which this study is undertaken, objectives of the study, the research questions, the significance and scope of the study. Lastly, the chapter also gives definition of key terms.

Chapter Two: Literature Review

The second chapter is presented in two main parts. The first part provides a critical review of literature relevant to this study by presenting it in subsections addressing the teaching of mathematics, language of teaching and learning, context of rural high schools, English second language learners, and teachers' experiences. The second part of chapter two presents a theoretical framework adopted for this study.

Chapter Three: Research Design and Methodology

The third chapter lays out the research design, methods and procedures employed for the execution of this study. Moreover, the chapter provides a description of research paradigm and approach, research instruments, methods of data generation, analysis and presentation. The location and population of the study is discussed, followed by the sampling procedure, limitations of the study, dependability, trustworthiness and ethical issues arising from this study is presented in chapter three.

Chapter Four: Data Presentation and Analysis

The fourth chapter begins by making a detailed description of the research three participants' profiles. An explanation of how the research instruments were used to generate data is provided, followed by a presentation of data generated from interviews and lesson observations of research participants.

Furthermore, chapter four provides an analysis of the findings categorized in themes aimed at addressing the main research questions of this study.

Chapter Five: Discussion and Conclusion

The fifth chapter deals with the discussion and provides a conclusion based on the findings of the study. Chapter five also exposes the limitations noted on conducting this research and makes recommendations based on the findings of the study.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

To report on the experiences of mathematics teachers with teaching the subject to isiZulu home language learners, it is necessary to provide a review of existing literature on research that is related to this study. While the previous chapter lays out the structure of this study by presenting a brief overview of each of the chapters, from the first to the fifth chapter. This chapter is presented in two parts, the first part provides a comprehensive literature review, and the second part presents phenomenology as a theoretical framework underpinning this study.

2.2 Literature review

The comprehensive review of literature aims to shed light on the phenomenon under study, which is the investigation of mathematics teachers' experiences and the context of rurality, as well as mathematics teaching to learners whose home language is isiZulu, a language different from the official language of teaching and learning. The study of teachers' experiences is hoped to provide an invaluable insight on their nature and the influence they have on the teacher as they plan mathematics lessons and facilitate learning, as well as assessments. An exploration of the context of rurality when teaching a subject like mathematics is expected to provide invaluable insight on how this context promotes or hinders effective mathematics teaching. Context of rurality in the South African province of KwaZulu-Natal, ILembe District, is a place where isiZulu is the home language of learners and majority of teachers. Moreover, it is imperative to report on the nature of the subject mathematics and its teaching in such contexts.

2.2.1 *Teaching in Rural Contexts*

The context of rural education in South Africa is marred by poor infrastructure, low levels of education and literacy rates among adults. The province of KwaZulu-Natal, along with Eastern Cape and Limpopo are home to the most deprived and poorly developed rural communities in the country, such conditions are evident in the

impoverishment and low-quality education in the rural areas in these communities (Mukeredzi, 2016). According to du Plessis and Mestry (2019), poor levels of education in rural areas are exacerbated by parents' economic status, as most are not educated, and their sources of income are from performing menial work, thus their low economic status means they are unable to assist their children with their schooling needs required by teachers as learning resources which affects the quality of learning in rural schools. Moreover, their study reports on the difficulties experienced in the recruitment and retention of quality teachers in rural areas, their study laments the state of rural schools' infrastructure and services that are key in the delivery of effective teaching and learning such as water, sanitation, electricity, school buildings, and textbooks.

Hlalele (2012) presents a study on mathematics anxiety by learners attending rural high schools, he suggests that the design and setting of academic spaces ought to help learners feel more confident and optimistic about their potential for success in the subject. Academic setting creates the mood necessary for improved motivation, belief in personal capacity, confidence, and thus better academic performance in mathematics. Moreover, the TIMSS Working paper series on subjective well-being and mathematics performance also factored in learners' satisfaction with life as an additional status that leads to mathematical achievement (Fadiji, 2022). Furthermore, the Working paper suggests that learners be supported in life both at home and school.

2.2.2 Teachers Experiences in Rural High Schools

Teachers who teach in rural contexts experience myriad of challenges ranging from infrastructure, parental support and shortages of teaching and learning resources for effective teaching. A paper by Professor Relebohile Moletsane, current John L. Dube chair on Rural Education in the University of KwaZulu-Natal, School of Education, raises a pertinent question: 'What would it mean to study the often marginalised rural contexts, particularly schools, from the perspectives of those who live, work and learn in them?' (Moletsane, 2012, p. 4). The involvement of those directly affected by issues arising from their day to day interactions within a rural context is paramount in understanding the issues from their view.

According to du Plessis and Mestry (2019), it is common for teachers in rural schools to experience teaching different grades in one class. This multi-grading teaching is

time consuming, and affects the teachers planning and classroom instruction, consumes time and has negative repercussions for the successful attainment of learning objectives as maintaining discipline in such environments is an issue. Ngwenya (2019) posits that effective teaching involves providing feedback on learner performance and assist individual learners on aspects of their learning that has been identified as deficient upon assessment, this exercise is made difficult by large class sizes in rural schools and teachers cannot create effective learning opportunities outside the classroom, as learners come from unsupportive home conditions and the problem is compounded by the limited grasp of the English language.

The importance of language in the delivery of effective teaching and learning is well documented in literature concerned with the education of learners learning in a language that is not their home language. A study on pre-service teachers' perception of rural high school learners as having a problem with the English language found that they were demystified by their experiences with learners understanding and communication of subject content in English. Lack of theoretical modules on rural education did not help in preparing the pre-service teachers on what to expect (Masiniri, 2015 & Mukeredzi, 2016). Bosman and Schulze (2018) stress the importance of teachers to have knowledge of their learners preferred learning styles as learners are not a homogenous group and training for teaching in such environments is required. This knowledge is crucial for the mathematics teacher to design their pedagogy for the benefit of learners who are auditory, visual and kinaesthetic.

2.2.3 Teaching mathematics to isiZulu home language speakers

International studies conducted on mathematics teaching to learners in rural contexts advocate for the employment of realistic mathematics education, where learners are taught using their daily life experience to promote mathematical reasoning in problem solving and improve their communication skills (Palinussa, Molle & Gaspertz, 2021). This implies that teaching and learning is most effective when learners' context and experiences are considered during the planning and facilitation of the learning process. An inquiry on mother tongue employment to supplement mathematics teaching in Nigeria indicated that classroom mathematics instruction using mother tongue as a tool for learning improves learners' attitude towards the

discipline, and translation of learning material by professionals should be considered (Mpalami, 2022). There appears to be consensus among scholars on the importance of incorporating learners' mother tongue when teaching mathematics to learners whose home language differs from the official language (Department of Basic Education, 2018).

According to van Laren and Goba (2013), it remains the responsibility of higher education institutions to produce 'authentic mother tongue teaching material' (p. 7) for the status of mother tongue education elevated. The status isiZulu was perceived to be lower against English, a language widely viewed as beneficial for access to better economic opportunities. Engaging in critical reflection on the learning experiences of learners is important for advancing beyond the normal cultural context, special discourse of classroom mathematics, and the official medium of instruction. This reflection aide in positioning language as a tool for investigating innovative practices that foster effective learning and creativity in the classroom, guided by an educational practitioner to identify innovative language deployment in the classroom (Planas, 2018).

Wildsmith-Cromarty (2018) makes a suggestion of allowing the use of translanguaging to produce alternative terms in isiZulu language to enrich the academic register and discourse. Another strategy adopted by teachers of mathematics to isiZulu home language learners to support learning and encourage participation is code-switching. Findings from a study conducted at a tertiary institution lecture indicate that students tend to participate freely and are actively involved, engagements are improved when the lecturer uses isiZulu to explain and clarify concepts in a mathematics lesson, followed by an explanation in English, rather than when a lecture is conducted entirely in English (Kahiya & Brijlall, 2021; Maluleke, 2018). Language plays an important role in the learning of mathematics in the classroom, for this reason, is essential for language to be used to communicate the mathematics, rather than become an impediment to its learning (Department of Basic Education, 2018).

The limited grasp of English as the language of teaching and learning by learners requires an understanding of how everyday language uses can be deployed to facilitate learning in more formalized context. Providing a distinction between everyday language and language used in learning a particular subject, Cummins (1999) states

that between everyday language and formal discourse by presenting the terms 'basic interpersonal communicative skills' (BICS) and 'cognitive academic language proficiency' (CALP). Understanding social language and academic language is important for the attainment of successful learning, it is knowing this distinction that is needed for understanding how language varies inside and outside the classroom (Essien, 2018). Furthermore, Cummins stresses the importance of demystifying the nature of academic language when teaching mathematics in a classroom, and the precaution that should be taken by all mathematics teachers against judging learners mathematical proficiency based on their lack of fluency in English (Robertson & Graven, 2020). Acquisition of academic language by learners is important for successful reporting on mathematical findings, engaging in tasks and academic assignments.

Recognising the importance of training mathematics teachers for foundation phase in an indigenous language, some universities across South Africa began incorporating African languages in their foundation phase teacher education programs. While this initiative is welcomed for its role in developing African languages and learning benefits for learners in rural and township schools, the status of English as a '*lingua franca*' in South Africa threatens the prospects of students choosing to do their foundation phase teaching qualification in an African medium. In a South African context, those whose training and qualifications to teach in an African language would be excluded from the 'more lucrative' posts in English medium schools, and confined to teach in less privileged rural and township schools (van Laren and Goba, 2013).

Despite the fact that English is viewed as a language for better access to economic status, the study on foundation phase pre-service teachers revealed that they looked forward to teaching mathematics to learners in their home language (van Laren and Goba, 2013). Research on mathematics teaching and learning in rural schools is limited, Mbhiza (2021) lament the inadequacy of research on mathematics teaching and learning in rural areas. The lack of adequate mathematics education research in rural areas was noted following findings that learners in rural contexts believe witchcraft is used by others to achieve their ends. It is this lack of adequate research in rural areas that leaves much to be desired, particularly on mathematics teachers' experiences with isiZulu home language learners in rural high schools

2.3 THEORETICAL FRAMEWORK

2.3.1 Introduction

The theoretical framework provides the lens from which the findings of this study are viewed. An investigation of teachers' experiences necessitates the adoption of Phenomenology as a framework underpinning this study. In making the case for phenomenology as the framework and methodological design for this study, this part begins by providing a historical background, citing the early thinkers of phenomenology and the debates on foundational principles of conducting studies, and viewing data within the framework.

2.3.2 Phenomenology

Phenomenology as a philosophical guide is used as a framework to understand the lived experiences of an individual from their subjective reality. Scholars interested with phenomenological research offer a multitude of phenomenology styles, and thus a myriad of definitions of the phenomenon exist (Qutoshi, 2018). Phenomenology scholar Robert Sokolowsk suggests that relooking at what we often look through does not happen accidentally and must thus be pursued with meaning. As this study endeavours to record and report on the experiences of teachers, it adopts phenomenology as a framework. In an attempt to achieve a better understanding of phenomenology, its principles, and characteristics, studying the works and theoretical posits by fore-thinkers such as Edmond Husserl and Martin Heidegger are essential as their contribution in the field remains relevant today (van Manen & Adams, 2017).

Husserl was a forerunner in the conceptualization of phenomenology as a qualitative research approach towards the study of lived experiences of individuals and the meaning attached to their experiences (Alase, 2017). The description of features of a phenomenon from their appearance in consciousness is associated with Husserl's transcendental phenomenology. Transcendental phenomenologists are required to practice and master phenomenological reduction or bracketing (also epoche), explained as the suspension of judgement and biases for the data analysis process, this is done to achieve a closest view and description of an experience without it being influenced by pre-conceived beliefs (van Manen & van Manen, 2021; Suddick, Cross, Vuoskoski, Galvin & Stew, 2020; Alase, 2017).

Suspending of judgement in transcendental phenomenology means that an experience cannot be viewed from any other lens or theoretical framework, a view that Heidegger expressly challenged as he strongly believed that it is not possible for people to successfully execute bracketing or suspend prior knowledge altogether. Heidegger (1988) asserts that a person and the environment are one and cannot be separated, the 'self and world are the basic determination of the Dasein itself in the unity of the structure of being-in-the-world' (p.297). Heidegger believed that bracketing was not possible because our understanding of an experience perceived from our pre-existing experiences or existence in the world. Existence in Heidegger's hermeneutic phenomenology is referred to as *Dasein*, loosely translated to 'being there'. The argument by Heidegger expands to suggest that things perceived are interpreted based on an existing schema, and within already known contexts that their interpretation is made and understood (Gyollai, 2020).

In hermeneutic phenomenology, a researcher concerned with the translation of text or understanding an experience will not engage in the interpretation exercise while in a complete state of neutrality but will do so with their previously held meanings and pre-judgements on the phenomenon under study (Lauterbach, 2018). What is essential here is the awareness of such biases, declaring them to allow for the experience interpretation to produce meaning that is the closest representation of fact. Phenomenology is concerned with bringing to bare that which has fallen deep into forgetfulness. According to Frechette, Bitzas, Aubry, Kilpatrick and Lavoie-Tremblay (2020),

The main objective of interpretive phenomenology is to uncover or disclose a phenomenon by pulling away layers of forgetfulness or hiddenness that are present in our everyday existence (p. 2)

It is the same forgetfulness that most people would suffer from when required to recall and describe in detail the structure and colour of their neighbourhood supermarket, despite having frequently visited or passed by the place before. The collection of lived experiences from human experience through dialogue best represents what phenomenology represents. Heidegger deposits that a phenomenon is uncovered ontologically by a human being through Dasein, a state of being in the world and interpretation derived from human experience (Buckley, 2018).

Hermeneutics originates from the Greek word *hermeneutikos*, which translates to mean the craft of interpretation. Interpretive hermeneutics takes form in three ways, namely, the meaning of the textual format it is represented (text), the context within which it is to be understood (context) and its purpose or intention (pretext) (Pérez, Nieto-Bravo & Santamaría-Rodríguez, 2019). Heidegger presents the fore-structure necessary for achieving understanding, this structure places pre-existing knowledge 'fore-havings, fore-sights and fore-conceptions.' Knowledge of the context within which the phenomenon is to be interpreted is referred to as fore-havings, the approach adopted to the matter under study is fore-sight and the significance attached to the meaning made through interpretation of the thing being studied is referred to as fore-conceptions (Gyollio, 2020).

According to Vagle (2018) interpretive phenomenology draws its functions from philosophical ideas of Heidegger, its philosophical tenets are anchored in a view that the phenomenon is the unit of analysis, the methodology follows on a premise that the 'phenomenon manifests ontologically in particular situations and contexts and that understanding the phenomenon is an act of ongoing interpretation' (p. 16). Within phenomenology as a framework, this study adopts Interpretative Phenomenological Analysis (IPA) as a method and lens from which the experiences of participants are viewed. Interpretative Phenomenological Analysis is sourced from the roots of hermeneutic traditions and is concerned with understanding how a given person sees or experiences a given phenomenon, within a given context (Cuthbertson, Robb & Blair, 2020).

An analysis of how people within a particular context make sense of their experiences provide for interesting outlooks on viewpoints of how a phenomenon can emerge from an experience deemed ordinary. Smith, Flowers and Larkin (as cited in Alase, 2017) as leading theorists of IPA state that 'IPA is a qualitative research approach committed to the examination of how people make sense of their major life experiences' (p. 9). The human nature of participants enables them to be reasonable and aware of their surroundings and reality, thus their sharing of lived experiences provides valuable insight on the meaning they attach to their experience. It is embedded in IPA as an approach to ably provide a comprehensive examination and interpretation of research participants lived experiences as they make sense of their lived reality. For Heidegger, acts committed by human beings are 'in the world' and it is therefore not possible to

eliminate the world when assessing activities of human beings. It is for this reason that sound interpretation of human beings' actions must be done considering the contextual factors within its surroundings (Vagle, 2018).

Interpretative Phenomenological Analysis (IPA) studies emerge from phenomenology, which is a view of 'structures of consciousness' from the participant who has first-hand experience of the phenomenon, and hermeneutics, which is the 'study of interpretations', would provide understanding of participant perceptions and experiences' (Cuthbertson & Blair, 2019, p. 97). An IPA study is concerned with the interpretation of a lived experience of a participant by allowing the experiential account to reveal the experience on its own terms, restricting contamination of the data with prior held conception and anticipating a particular outcome (Alase, 2017). This interpretation of an experience is done jointly with the participant, as the participant makes sense of their experience, the researcher is also making an effort to understand the experience as it is shared.

Heidegger presents a hermeneutic circle as a description of understanding and interpretation. In the hermeneutic cycle, the main essence of interpretation is that it is ongoing and textual interpretation must be understood within the context in which the text was written (Vagle, 2018). Ramsook (2018) states that the design of the hermeneutic circle allows for understanding of an experience through its interpretation from the whole to parts. The hermeneutic cycle and Interpretative Phenomenological Analysis are used in this study to achieve thorough interpretation of the data (Larkin, Shaw & Flowers, 2019). The hermeneutic circle:

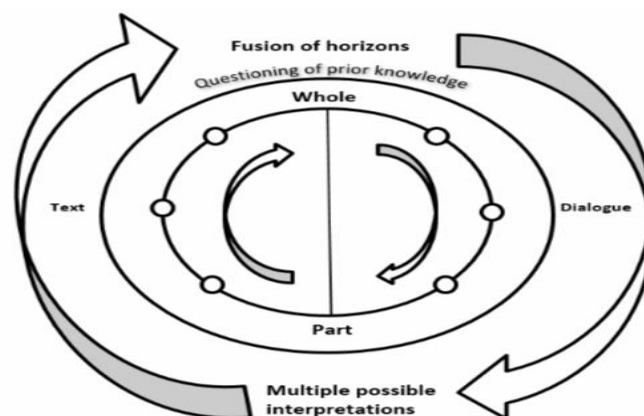


Figure 1.

The hermeneutic circle allows the researcher to view the participants experience in a cycle, beginning with establishing an awareness of fore-conceptions (questioning prior knowledge) on the phenomenon under study. A dialogue between the researcher and the participant narrows the participants experience to how they make sense of their experience and makes possible the production of text which expresses the experience as narrated by the participant. The experiential account of the participant is interpreted and analysed in parts, which help achieve an understanding of the whole phenomenon (Mâlqvist, 2015). An analysis of the participants experiential account by analysing its parts helps attain an improved view, thus accurate reporting of a participant's experience that gives rise to understanding a phenomenon.

As the researcher assumes a critical role in the research process, in interpretative phenomenological analysis the research participant is viewed as an experiential carrier, whose experience cannot be accessed without a back and forth engagement between the participant and the researcher. The engagement between the researcher and the participant in the interpretation of an experience occurs in a back and forth arrangement, during this process the researcher makes sense of the participant's accounts while the participant makes sense of their own experience. For this back-and-forth movement is synonymous with the operations within the hermeneutic circle. The hermeneutic circle (figure 1) is a cyclical analysis between smaller parts of meanings contained in the participant's story, the analyses of parts is aimed at achieving an improved understanding of the whole experience, thus achieving an understanding of the phenomenon under study (Smith, Flowers & Larkin, 2009).

The hermeneutic circle consists of the whole, an analysis of the whole is done through a view of parts or themes from an experience, and then a synthesis of themes presents an improved understanding of the whole, in a cycle. In the hermeneutic circle, interpretation is subject to constant revision, the researcher revises their understanding of the whole as the understanding of individual themes improves (Neubauer, Witkop & Varpio, 2019). This cycle of understanding moves from the object under study, to personal understandings of the researcher and back to the object. On application of the hermeneutic circle, Montague, Phillips, Holland and Archer (2020) present the recurring shift between 'parts and whole', the movement from sentences constructed by words to form paragraphs (parts) to the development of full transcripts (whole). This cyclic movement is aimed at assisting the researcher and the research participant to collaboratively create an account of the experience.

An experience of something is undergone with its meaning constructed within us, such as a person conducting phenomenological research is concerned with the 'consciousness grasp' of what constitutes meaning of a lived experience (Vagle, 2018, p. 7). To research and establish the meaning attached to an experience with accuracy, the participant is involved in validating the meaning implied by their accounts through a back-and-forth process, almost co-creating the meaning with the researcher. The cornerstone of IPA research and what researchers adopting the approach in developing qualitative research should always strive to 'understand, interpret, and amplify the lived experiences of the research participants' by ensuring that their lived experiences are expressed as meant by the participants with utmost dignity underlying accurate reporting (Alase, 2017). Pietkiewicz and Smith (2014) state that the inductive nature of IPA necessitates that theory is drawn from the data. Thus, no theory is presented beforehand.

CHAPTER THREE

RESEARCH DESIGN & METHODOLOGY

3.1 Introduction

The previous chapter explored literature relevant to this study's undertaking, which is to investigate teachers' experiences with teaching mathematics to learners who are isiZulu home language speakers in rural high schools. The literature reviewed reports on the state of school education and teachers' experiences in rural contexts, teachers' experience of teaching mathematics to isiZulu home language learners in classrooms where the official language of teaching and learning is the English language. There appears to be minimal scholarly literature reporting on teachers' experiences with teaching mathematics in rural contexts, particularly to a large population of isiZulu home language speakers in KwaZulu-Natal.

When conducting research, it is essential for researchers to respond to the questions; 'what they want to do, why they want to do it and how they want to do it' (Kacprzak, 2017, p. 59). It is the responses to these questions that identifies the rationale and charts a path and the direction of the study, and it is the openness and transparency that presents the study as authentic. Qualitative research depends largely on the formulation and use of research questions to determine the direction the study takes and the knowledge generated from the produced data (Alase, 2017, p. 13).

In quest for a better understanding of the phenomenon under study, this research poses the main questions:

- I. What are teachers' experiences in teaching mathematics to isiZulu home language speakers' in rural high schools?
- II. How do teachers' language experiences assist in the teaching of mathematics to isiZulu home language speakers for understanding in rural high schools?

Furthermore, the latter part of the previous chapter presents and justifies the adoption of phenomenology as a framework and a method of inquiry as the study seeks to investigate teachers' experiences.

In this chapter, a detailed description of the methodology employed by the study is presented. In dissecting this study's methodology, a presentation of the research paradigm within which this research is located, the research design employed by this study, gaining access, the context and location of the study, the sample and sampling procedure, methods of data collection, analysis of data strategy adopted, trustworthiness, ethical issues and methodological limitations of this study. Lastly, a summary of the chapter is provided in the conclusion part of the chapter.

3.2 Research Paradigm

A research paradigm is concerned with the techniques and strategies employed in conducting an enquiry. Frechette, et al. (2020) define paradigm as a common practice, agreed upon and shared by community of researchers that prescribe on methodological approaches and procedures in a quest to a research problem. Methodologies used in research can be placed into four paradigms, namely: positivism, critical, interpretivism, and postmodernism. Each paradigm is explicitly distinguished according to its ontological and epistemological assumptions (O'Donoghue, 2007). The major ontological assumption within the interpretivist paradigm is that a lived experience must be understood within the cultural influence and its meaning, while accepting likelihood for a multitude of realities. The epistemological assumption is embedded subjectivity within the interpretivist paradigm (Kelly, Dowling and Miller, 2018).

Interpretive phenomenology, in the words of Frechette, et al. (2020) refers to a study that 'is set apart by anchoring its research tradition in a unique understanding of being' (p. 4). Understanding of being in this instance refers to the participant or researcher, otherwise known as *Dasein*. Heidegger's philosophy and IPA provide a useful twin outlook of questions interested in unearthing a human experience of a phenomenon, 'this combination is considered invaluable in generating research findings, which firstly showcase to other researchers the value of Heidegger and IPA in a study of phenomenon that requires the production of an intelligible lived experience' (Bordogna, 2021, p.3)

Studies concerned with investigating experiences of participants in detail are well placed within Heidegger's philosophy combined with IPA for optimal results (Bordogna, 2021). Kivunja and Kuyini (as cited in Cuthbertson & Blair, 2019, p. 97)

suggest the adoption of interpretivist paradigm when confronted with a study whose aim is to understand experiences of individuals or groups. The choice of an interpretivist paradigm in such instances is owing to its ontological assumption that reality is plural and thus requires an epistemological outlook which allows for the interpretation of research participants perceptions according to their reality, how they see it and the meaning created.

Alase (2017) deposits that for interpretive phenomenological analysis research approach to provide depth, as 'lived experiences' of research participants are shared through stories, it is crucial for the researcher engaging in interpretation for sense making to have better understanding of the 'lived experience' of the participant (p. 12). To achieve depth in understanding 'lived experience', it is important for the researcher to put themselves in the participant's position. The search for answers to the question: what are teachers' experiences of teaching mathematics to isiZulu home language speakers in rural areas? Presupposes that experiences are personal, thus meaning created from the experience is subjective and not to be viewed exclusively without considerations of the context within which the experience occurs.

3.3 Research design and methodology

The prime contesting research methodologies are qualitative and quantitative research design, with both in competition on which method is best suited for a particular inquiry, to produce either explainable (words) or quantifiable (numerical) a more scientific and dependable results (Alase, 2017). Qualitative research is concerned with amplifying voices of the research participants, providing depth in understanding situations which cannot be reported on in quantities but in detailed narration of an experience or description of an event (Larkin, et al., 2019). Qualitative research methodologies present a variety of data analysis approach, these include Grounded theory approach, Narrative approach, Ethnographic approach, Case Study approach and the Interpretive Phenomenological Analysis (IPA) approach (Vagle, 2018). In this study, the IPA approach is adopted as it investigates the lived experiences of participants and aims to amplify their experiential accounts of teaching mathematics to isiZulu home language speakers in rural areas.

Phenomenology, as a qualitative research design, adequately fits studies exploring the experiences of participants and their perceptions of the phenomenon (Ataro,

2020). Moreover, Creswell (as cited in Vagle, 2018) asserts that ‘a phenomenological study describes the common meaning for several individuals of their lived experiences of a concept or phenomenon.’ (p. 11). The adoption of IPA in this study provides for an understanding of the lived experience of the mathematics teachers in a class of isiZulu home language speakers and an exploration of the phenomenon under study.

3.4 Gaining access

Informed consent

The rights and privacy of research participants is sacrosanct and ensuring that they are protected is pivotal for meeting the minimum standards of credibility and respect for the research project. Alase (2017) stresses that IPA research must always make participants aware that they reserve the right to be excused from the research at any time and may exercise their full discretion on which questions they are comfortable with and may refuse to respond to some questions whenever they deem fit. This is clearly explained to participants, perimeters of the study are read out and discussed in the language choice of the participant and upon attaining permission, their written approval is required prior to their participation in the study.

To ensure the confidentiality of information and the privacy of the research participant, the highest standards of ethics are upheld in the management of data obtained for use solely for the purpose of this study. To maintain anonymity, Ramsook (2018) recommends the use of pseudonyms instead of participants’ real names, and only present pieces of information upon agreement with the research participant, removing all parts of information whose presentation consent is withdrawn. Observing ethics through the research process is mandatory.

3.5 Context of the study

Conducting qualitative research requires a careful selection of participants and site of the study in accordance with the central question of the study. This selection must be guided by the question of suitability to best help the study achieve its objectives as it investigates the phenomenon (Alase, 2017). The central phenomenon under investigation demand that the site of this study be in a rural area, with isiZulu as the home language of the school and learners of mathematics. This study is conducted

in schools located in the province of KwaZulu-Natal, in Ilembe District, Ndwedwe. The learners attending schools chosen as sites for the study are from the community and mathematics teachers identified are isiZulu home language speakers.

3.6 Sample and sampling procedure

The sample and sampling in traditional qualitative research allow for variations based on the methodology chosen for the study. The nature and depth of information required, coupled with the researcher's discretion assist in arriving at the decision on sample size and sampling procedure (Ramsook, 2018). However, adopting phenomenological research exposes the researcher to recommendations on the number of participants to be between three and ten people, some suggest two to 25 participants may be adequate, but may vary depending on several specific factors (Sim, Saundersa, Waterfield and Kingstonea, 2018; Alase, 2017). Sample sizes in IPA studies are generally small, this allows for a detailed analysis of each case. Attaining minimum size and maximum depth is pursued for this research to report on the lived experiences of mathematics teachers in rural high schools. As a starting point, utmost integrity and care must be taken in selecting a sample and securing a sample size that will help achieve the aims of the study, as relevance and credibility partly relies on this process.

3.6.2 Sample and its characteristics

Phenomenological research sample sizes are usually small as the focus of this type of research is on collecting experiential accounts of participants who are homogeneous. The homogeneous set-up sample in this instance aids in the production of rich data gathered from people who have a shared experience and can provide a focused perspective, where converging and diverging accounts are nuanced (highlighted) for a detailed interpretation and understanding of the subject-matter under investigation (Larkin et al., 2019; Alase, 2017). Moreover, Eddles-Hirsch (2015) explains that the selection of a miniscule sample size, in phenomenological studies, is aimed at satisfying the depth desired when investigating the experiences of research participants. The adoption of IPA for this study required it follows a direct predetermined selection of the studies participants based on their perceived potential to provide rich data, and the context where they are found be clearly described for sensitivity and awareness (Pietkiewicz & Smith, 2014).

Given the IPA route taken by this study, and the complexity associated with studying human experience, the sample size for this research will be capped at three participants. All participants are mathematics teachers who are isiZulu home language speakers, teaching a class of learners from the rural community the school services. The sample site of the study is three schools located within a 10km radius, with each school providing one participant to help achieve the objectives of the study. All schools are in ILembe District, Ndwedwe, in the province of KwaZulu-Natal. The three participants were selected based on their sites of operation being a rural high school, their teaching of mathematics to isiZulu home language speakers and their teaching experience being no less than four years in the same context.

3.6.2 Purposive sampling

Research conducted within the community of IPA sources its participants from a 'fairly homogeneous sample' (Pietkiewicz & Smith, 2014, p.9). In line with IPA sampling procedures, a purposive sampling technique is used to allow for participants whose experiences are most likely to bring about an improved understanding of the phenomenon. A selection of a purposive sample secures high probability for participants' responses to be useful and relevant, thus improve the quality of the study (Andrade, 2021; Campbell et al., 2020). The justification for purposive sampling lays on an assumption that knowledge, experiences, and expertise possessed by a person or group provide a rich insight necessary for a better understanding of the phenomenon. Since the research method, hermeneutic phenomenology, is based on personal "lived experiences" (van Manen, 1990) and interpretations (Gadamer, 1997), only certain persons may be deemed suitable as participants for data generation. The most important criterion is that the selected interviewees experienced the phenomenon under study.

Participants are selected based on the certainty that they possess real experiences and intimate knowledge about the phenomenon that is studied. A critical question for selection is: 'Do these persons have the experience?' (Ramsook, 2018, p. 16). Participants for this research were selected using purposive sampling strategy. According to Taherdoost (2017), purposive sampling is the deliberate selection of participants in order to provide information that cannot be obtained through other means. The reasoning to selecting a specific sample is owing to the inductive nature

of IPA and has a direct bearing on the findings of the study. The unit of analysis being experiences from the subjective perspective of participants, it stands to reason for the researcher to analyse the phenomenon in depth taking cognizance of the context the phenomenon emerges from (Larkin, et al., 2019, p. 185).

This study is conducted on a sample size of three teachers who teach high school mathematics to learners whose mother tongue is isiZulu in grade eleven. Teachers were selected from three different schools, one teacher per school, and their selection will be done purposively based on their use of isiZulu as a tool of conducting and/or supporting classroom mathematics learning. Selected teachers will have a minimum of four years teaching mathematics at the school, or prior experience in similar context. This sampling strategy helps achieve the research objectives and saves time.

3.7 Data collection methods

The report will be based on data generated from lesson observations and interviews. Data generated from lesson observations and semi-structured interviews are none numerical, thus this study follows a qualitative research approach. Qualitative research aims, in part, to understand rich human experiences and reports on reflections of those experiences (Gopaldas, 2016). Through narrating and reflecting on experiences, participants will assist in establishing 'how' and 'why' the phenomenon under study occurs. Qualitative research makes use of a variety of data collection methods including observations, interviews, focus group meetings and text analysis. The employment of different data collection methods is aimed at acquiring a more in-depth understanding of the phenomenon as it lays embedded on the research participant's perspectives and views (Qutoshi, 2020).

It is not possible to conduct research without determining what you are seeking to find out and declaring what is sort after assists in the enactment of guiding parameters. Working within the phenomenological research principles requires the researcher to 'bracket' his or her opinions as much as possible 'during interviews of participants and collection of research data' (Alase, 2017, p. 15). The data collection procedures followed for this IPA study is the gathering of semi-structured and unstructured interview responses from participants. The duration of interviews is approximately 45 minutes to an hour per session, conducted per participant. In classroom lesson observations are conducted to obtain a recorded view of the participants' experience.

Electronic recording device is used to video record lesson observations and audio record one-on-one interviews with the research participants at their respective schools (Alase, 2017). Interviews are conducted using guiding questions on the interview schedule, while video records of lesson observations are viewed against the observation schedule to record significant interactions and acquisition of lesson objectives during a maths lesson.

A phenomenological research proponent Van Manen (as cited in Vagle, 2018), in making a case for phenomenology as a scientific enquiry, states that it is “a systematic, explicit, self-critical, and intersubjective study of its subject matter, our lived experience” (p. 11). A pioneering scholar and teacher of phenomenology, Husserl, deposits that human science is best done when the researcher makes a deliberate shift away from the natural attitude of viewing things to a phenomenological attitude. A phenomenological attitude is when we question that which we usually take for granted or overlook, where we question what everyday experience is and that which is accepted as obvious, a phenomenological researcher dives deeper (Vagle, 2018).

Data generation will be made through lesson observations, in-depth one-on-one semi-structured interviews, an attempt to get written anecdotal reflections was unsuccessful, this was due to the participants’ work schedule pressures associated with the school calendar ending. In conducting semi-structured interviews, this study adopts Seidman’s three phase interviews per person (Beven, 2014). The first questions will be focusing on the participant’s own historical experiences with mathematics and context, the second questions will focus on the participant’s recollection and reconstruction of experiences with teaching mathematics to isiZulu home language speakers in rural areas, and the third questions will require the participants to reflect on the meaning of their experience.

Research methods within hermeneutic phenomenology include interviews, according to van Manen (2016) interviews serve two objectives, the first is to create in-depth and richer insights into the language experiences of mathematics teachers in rural areas and the second purpose is to forge conversations around the meaning of their experience.

3.7.1 Observations

Interpretive phenomenological studies commonly source data from interviews, which are complemented by participant observation as an authentic mode of data generation to unearth an experience (Frechette, et al, 2020). Observing a participant engaged in an action or experience holds great potential of uncovering practices that are taken for granted and ignite further probe of the phenomenon. Knowledge and understanding of the context in which a phenomenon occurs is crucial to understanding a lived experience of a participant. Vagle (2018) states that performing participant observations is necessary to obtain a contextual view of the phenomenon and to help develop more questions on the experience upon getting a glimpse. This study relies on semi-structured observations to view the teacher interacting with learners in a mathematics classroom, with an aid of a guide on observations in the form of an observation schedule is attached as Appendix B.

Interpretation ought to be grounded well in understanding the context under which the experience occurs. This is because communication can take many forms including 'verbal, non-verbal and written', this is what Heidegger refers to as "exegesis", interpretation which is derived from non-verbal forms of communication (Ramsook, 2018, p.15). The aim of phenomenological research is not to create a general outlook of the phenomenon under study, it is also neither for quantifying or finding a predefined truth or objective and provable facts as is the case with experiments. Phenomenological research fixated on gaining a deeper insight and understanding of a human experience, an everyday phenomenon, that usually easily slips through to many as obvious (Vagle, 2018). Thus, observing the phenomenon as it occurs holds potential to uncover its nature and form, this additional method of collecting data is aimed at confirming and probing further occurrences that might emerge.

3.7.2 Interviews

The focus of phenomenological research is on studying lived experiences of individuals or groups who have experienced a particular phenomenon. Ramsook (2018) posit that interviews in hermeneutics are used as a method of generating data, collaboratively between the researcher and the participant by using unstructured and semi-structured interviews. To achieve depth in understanding of lived experiences of individuals, the study relies on one-on-one interviews (Ramsook, 2018). This study

also makes use of open-ended questions that are not referenced or rely on existing literature (Alase, 2017). During the interviewing process, I used a semi-structured interview to forge a conversational type of interaction with the participant, this dialogue engagement allowed for 'enough space and flexibility for original and unexpected issues to arise, which the researcher may investigate in more detail with further questions' (Pietkiewicz & Smith, 2014, p. 9).

The purpose of conducting interviews in IPA research is aimed at facilitating a conversation which enables the participant to share their experience in their own words (Alase, 2017). Interviews are an essential method of collecting data from research participants whose experiences are being investigated. In qualitative research, interviews are a method of collecting data through having a 'conversation with a purpose'; to achieve depth, focus and direction, semi-structured interviews are a useful method of collecting data (Ramsoon, 2018, p. 15).

Prior to conducting the interviews, it is important for the researcher to establish a rapport with the research participant, as the participant is more likely to share their experiences in fully (Alase, 2017). Data acquired through a conversational dialogue is critical if mutual understanding is to be achieved between the researcher and the participant, the conversation must be aimed at establishing as much facts as possible on the subject matter (Ramsoon, 2017). Phenomenological studies adopt two main methods of generating data, these are phenomenological interviews which are unstructured, and the description of a lived experience by the participant (Vagle, 2018). It is crucial for the researcher gathering data through interviewing participants to strive to amplify the participant's voice with minimal influence and distortion, this is pursued by not filling in the silence and accepting conflicting statements without enquiring further.

The interviews conducted placed the participant at the centre of data generation by allowing them enough time to pause and reflect without interjection from the researcher. To allow for more data to emerge from the experiential accounts of participants, probing questions were posed through while also reflecting on 'non-verbal gestures' (Frechette, et al, 2020). In keeping with the IPA guiding principles for achieving length and depth of engagements during the interview process, this study followed an approach to the interview with an open mind, and a without pre-set

direction or outcome of the interview. The interviews were conducted at the participant's school premises, at the time of the interviewee's choosing, and the interview language preferred by the participants was isiZulu, with some English words and phrases. It is essential for the interviewer within IPA to put the interviewee at ease when asking them questions about their lived experiences (Alase, 2017; Pietkiewicz & Smith, 2014). IsiZulu common language between myself and participants proved beneficial to achieving depth in the description of an experience during interviews, while in a relaxed environment, with the participant at ease to reflect and share their teaching experiences in their home language.

While interviews for phenomenological studies provide for valuable insights into the lived experiences of research participants, this method of data gathering is prone to distortion by the researcher, thus the need to incorporate other methods of sourcing data as a strategy to strengthen credibility of data. In keeping with IPA and its philosophical underpinnings, whose aim is for participants to provide an 'in-depth exploration of their lived experiences and how they make sense of those experiences helps define the type of question which is suitable for an IPA study' (Pietkiewicz & Smith, 2014, p. 9). Employing other data gathering methods, like observation for this study, ensures the confirmation and highlights contradictions to pieces of information obtained through other methods which opens space for further probing aimed at refining the analytic process and provide credible findings. The incorporation of multiple data collection methods is referred to as triangulation. Using two or more data gathering methods allows for the emergence of pieces of valuable information which can be analysed in a back-and-forth movement, synonymous with the hermeneutic cycle (Frechette, et al., 2020).

3.8 Data analysis

An understanding of human behavior and social phenomenon is subject to multiple interpretations, so too is the study of teachers' experiences with isiZulu home language learners in mathematics classrooms. Prior to engaging with the experiences of participants, the researcher must reflect on their own biases stemming from their encounter with the phenomenon (Cuthbertson & Blair, 2019, p. 98). It is imperative for a researcher undertaking data analysis for a phenomenological study to begin by providing a description of the phenomenon under study according to their own

personal experience. The personal experience description is necessary for keeping the participant's story authentic and untainted by the researcher's preconceptions (Alase, 2017).

The main assumption for IPA studies is the reasonable awareness of the contextual realities to report on experiential accounts of participants who are already 'immersed in a linguistic, relational, cultural and other physical world' (Cuthbertson & Blair, 2019, p. 98). A congruent deposition by Vagle (2018) he advises researchers to 'spend time with the phenomenon, informally, to get a sense of how it might manifest in the contexts in which you are exploring it' (p. 98). Supporting this, Gyollia (2020) stresses that a researcher must have some level of pre-knowledge for understanding of what is to be interpreted, for understanding the context giving rise to a phenomenon under investigation is a prerequisite to its fair interpretation. While conducting this study, my contextual familiarity proved resourceful as I am linguistically and culturally immersed in the setting giving rise to the phenomenon from being an isiZulu home language speaker myself and having taught in a high school within the rural community for five years, at the time of conducting this study. My teaching experience and sharing a common home language with the participants became an advantage as no prior contextual familiarisation was necessary, a fair amount of time was saved and no additional human resources for secondary consultations and translation services were not sourced. The common teaching realities shared by the researcher and the participants assisted in understanding the participants' experiences as if I was 'in the shoes of the participants' (Alase, 2017, p. 12).

IPA researchers are required to audio record the interview process and transcribe the interview. Once the interview accounts from the participants have been audio-recorded and transcribed, the audio-record is listened to while reading the interview transcripts to quality check the transcription and familiarise myself with the data. Pietkiewicz and Smith (2014) recommend reading and re-reading of the transcript to 'immerse' the researcher with the data, and the potential of gaining a new and deeper insight is achieved by listening to the recording more than once. When re-reading the transcript, close attention is given to the content of the discussion, the use of language by the participant, the context in which the experience occurs, and the first interpretation of the experience. The researcher also engages in 'personal reflexivity'

on the potential influences of the research participants' responses that could arise from their view of the researcher's social status, age and gender.

The traditional technique of conducting research requires the researcher to read the interview transcript from a printout while making commentary on the margin, the final product of this exercise is 'a list of major themes and subthemes, and relevant short extracts from the transcript', with numbered lines for easy reference (Pietkiewicz & Smith, 2014, p. 12). The emerging themes from the interview transcripts are tabulated with verbatim responses from participants supporting the themes. The interview transcript data provide the researcher with significant statements which must be treated as equal, a list of these statements is then developed by the researcher (Alase, 2017, p. 16). After the researcher has read through the transcript and re-listened to the audio recording in order to gain insight into what is the experience of the participant, and how is its meaning conceptualized by the individual, the researcher goes on to provide annotations of emerging themes from the transcript (Kirn, Godwin, Cass, Ross & Huff, 2017).

A common approach to handling qualitative data requires interview responses to be transcribed verbatim, once printed on a paper, colour pens and highlighters are used to colour code responses within a category for thematic analysis (Alase, 2017, p. 16). Producing emergent themes from notes by the researcher requires formulation of phrases 'at a slightly higher level of abstraction' of conceptualization of the experiential account of the participant taken from the transcript. These phrases encapsulate the essence of an experience into themes, which are read as units, but understood in the broader narrative of an experience as captured in the interview transcript. The analysis of the parts (phrases of the interview responses) in relation to the whole (entire interview transcript) is synonymous with the hermeneutic cycle (Pietkiewicz & Smith, 2014).

The following step involves relating themes and clustering of themes to produce superordinate themes. At this stage, the themes with 'conceptual similarities' are grouped together, and connections are established while dropping those that do not synchronize well within the broader structure or lacking in evidence to support its standing (Pietkiewicz & Smith, 2014, p. 12). After grouping of relevant pieces of information according to its conceptual similarities, the researcher provides written

description (textural description) of the experience of the phenomenon from the verbatim responses of the research participant. This is followed by a written description of 'how' an experience occurred (structural description) in detail, which enable the researcher to reflect on the conditions and context under which the phenomenon is experienced. A writeup on both textural and structural descriptions as a composite is what gives the 'essence' of a phenomenological experience. The final stage of analysing data following IPA methodology is the 'long paragraph', wherein, a detailed response is made to both the question of 'what' is the participant's experience and 'how' a participant's experience arises in their context (Alase, 2017, p. 16).

In IPA, data analysis is done on a case-by-case arrangement, each participant's narration of their experience is analysed separately (individual analysis), before moving on to the next participant to repeat cyclic motion of interpretation. Focusing on a single participant at a time is intended at fostering the researcher to be familiar with the data in order to make description of experience, patterns of language use by the participant, and interpretation of a participant's responses on analysis of the interview transcript. Upon concluding the analysis of the first participant, the process begins with the second participant, and then followed by a cross case analysis between themes. The analysis between themes searches and identifies convergent and divergent experiences and the meanings attached to them by the participants within a given context (Kirn, et al., 2017).

The analysis of data gathered from participants follows on the prescripts of phenomenological studies. In phenomenological research, the 'unit of analysis' is the phenomenon (Vagle, 2018). Studies undertaken using Interpretive Phenomenological Analysis require the researcher to consider some key philosophical assumptions. These assumptions are namely; formulate an understanding of the world of the participant through engaging with accounts of people who are well versed with the 'linguistic, relational, cultural and physical world' of the phenomenon under study, and adopting an 'idiographic approach' in zooming into the particulars of data emerging from the research participant. Experience is not sourced directly from the participant's experiential accounts but from 'a process of intersubjective meaning making', deep reflection on personal experiences and assumptions is required prior to engaging with the experiences of the research participants. The researcher must remain committed to grounding the interpretation of the experience on the participants' view by guarding

against infusing personal interpretations, the interpretation here is related to the 'double hermeneutic' (Cuthbertson, et al., 2020, p. 98). This implies that the participants were making sense of their undergone experience, and the researcher trying to make sense of how the participant narrates their experience.

The assumption that interpretation of a phenomenon can be achieved without the researcher's influence of prior conceptions is farfetched from reality. A contrary argument puts forth a premise that; it is not possible to engage in any form of interpretation without prior knowledge or already existing schema about the phenomenon (Gyollia, 2020).

Idiographic nature of IPA sources its roots on the potential uniqueness of each experience depending on the person making sense of the experience and the context in which the experience occurs. The researcher absorption and involvement with the research data is known as 'inductive', and the back-and-forth movement during the data analysis phase through deep thought and reflection is referred to as 'iterative'. The 'interrogative' stage follows the incorporation of existing literature and theories to analyse and back-up the findings of the study. Recognising the particularity of an individual case is based on the adoption of an 'idiographic approach' (Cuthbertson & Blair, 2019, p. 98). Experiential accounts as provided by the participants of the study are 'idiographically' gathered and analysed for support of the formation of a case study for each participant. Moreover, an analysis is focused on themes that emerge from the data gathered from participants' accounts, which are analysed as independent units and remain open to further analysis between other units on broader scopes (Larkin, et al., 2019)

Sourcing experiences directly from participants through 'back and forth' engagement of intersubjective meaning making is an essential element of an IPA study (Cuthbertson & Blair, 2019, p. 98). Interview transcripts were shared with participants to validate and confirm their experiences capture as expressing their word, including meaning preservation on translated responses from isiZulu to English. Once the data generated through interviews were transcribed, participants were requested to validate if transcribed data reflects their views as expressed during interviews. Trimmed video records were shared with participant to improve contextual reporting

on mathematics teacher's classroom language practice as experienced, setting and other practices observed for commentary by the participants

Moreover, themes emerging from interviews and supported by classroom observations were analysed for convergence and divergence between the three cases. IPA permits for an open perspective in analysis phase to understand how the phenomenon relates with another, interrogate 'intersubjective' traits, and the 'microsocial' aspect of the phenomenon. The analytical construct of IPA begin with how the researcher understands the participant to be making sense of their experience, followed by a synthesis of the analysis across samples (Larkin, et al., 2019). The researcher assumes a dual role when handling data within IPA, namely, as a participant and a researcher. Alase (2017), writing about the role of the researcher in API states the following:

In one sense, the researcher is like the participant, is a human being drawing on everyday human resources in order to make sense of the world. On the other hand, the researcher is not the participant, she/he only has access to the participant's experience through what the participant reports about it, and is also seeing this through the researcher's own, experientially lens (Alase, 2017, p.11).

Gadamer (as cited in Ramsook, 2018) highlights that the process of hermeneutics involves both the researcher and the participant in the collaborative creation of meaning which is achieved 'through a circle of readings, reflective writing and interpretations' (p. 16). It is essential for each the transcript data to be viewed on its own terms, on a case-by-case analysis, allowing new emerging themes from each participant's account to emerge independently. The themes are then categorised into superordinate themes and subordinate themes, which are analysed for convergence and divergence between participants' experiences of teaching mathematics to isiZulu home language speakers in rural high schools (Gyollia, 2020).

To achieve better comprehension and understanding of the phenomenon under study, it is the individual's experiences and how they interpret an event that is essential (Ramsook, 2018). It is imperative for the researcher to limit influences of prior held conceptions of the phenomenon on emerging themes from the participant's experiential accounts. For the phenomenon to reveal itself naturally from the data during interpretation stage, it is crucial for the researcher to keep their prior held conceptions on the phenomenon in check (Gyollia, 2020). The researcher's own views and assumptions have the potential of contaminating the participant's experience with

personal views and assumptions on the phenomenon, to avoid this, the researcher must heighten their awareness of this potential compromise and must strive to achieve an interpretation of the participants account from the participants own views (Cuthbertson & Blair, 2019, p. 98).

Historically, the analysis of qualitative data has been marred with criticism over its lack of comprehensive detail on the methodology followed in arriving at the findings of its studies (Morgan, 2021). To explain how the analysis stage of IPA is to be conducted, Cuthbertson and Blair (2019) state the following:

The process is initially driven by researcher immersion in the study data (inductive) and analyses move back and forward through a range of different ways of thinking and reflection (iterative). Existing psychological theory and extant literature is subsequently incorporated to reflect and substantiate the study findings (interrogative) (p. 97).

As part of phenomenological analysis methods, the researcher must provide a statement of 'what' the research participants have experienced and 'how' an experience was received within a given context to bring about a phenomenon (Alase, 2017). Analysis in phenomenological research places the researcher deep within the data gathered from participants through interviews and observations. The researcher listens to interview recordings, reads observation schedules, reads interview transcripts and notes over and over again to obtain a clearer view and understanding of the key sections of the phenomenon, 'hermeneutic circle' (Frechette, et al., 2020, p.10). Data generated will be analyzed in parts in order to have an improved understanding of the whole phenomenon, this will be done in a cyclical way (Suddick, et al., 2020; Neubauer, et al., 2019).

The researcher engages in a 'two-stage' process of interpretation where the participants share their experiences with the researcher alongside trying to make sense of the participants' experiences, this collaborative process is known as 'double hermeneutic'. It is crucial for the researcher to exercise reflexivity during this process, to maintain a consciousness of own preconceptions and judgements that could compromise the purity of phenomenon as experienced by the participant (Cuthbertson, et al. 2020).

The involvement of participants is ongoing as they are called upon to validate interpretation in follow-up interviews (Frechette, et al., 2020). Original data is a valuable guide of IPA approach as all interpretations emanate from the experiences

of the study's participants, and the data analysis provides extracts from the raw data to support claims made (Shinebourne, 2011). By referring to verbatim experiential accounts from the interview transcript serves two purposes, the first is validating assertions made from interpretation of the participant's experience, and the second purpose is for the preservation of the voice of the participant as it expresses meaning of an experience as held by the first person.

Furthermore, a final IPA project incorporates the experience of the participant in his or her own words, and the interpretations of the researcher. As Pietkiewicz and Smith (2014) state, 'a final list may comprise of numerous superordinate themes and subthemes' (p. 9). They point out that it is vitally important for researcher analysing data from an IPA approach to observe 'sensitivity to historical, social, and political context, as it happened in relation to narration, discourse or rationality. When sensitivity to context is upheld, the study reports on its themes in analysis, and shares some information about the lives of the participants' stories (Kacprzak, 2017).

An analysis of verbatim extracts is made within its context, as a part of a broader experience that is supported by raw data. It is important to tabulate the participants' responses, with an interview schedule and the direct quotations to preserve the authenticity and essence of their experiences in analysis (Kacprzak, 2017). In IPA, the questions posed to participants are aimed at unearthing their experiences and reporting on their accounts as per their description, this is followed by analysing the responses against existing theoretical perspectives on the phenomenon. The latter stage requires a careful balance to must be struck between the experiences of participants as they narrate them and theories, to make a case for convergence and divergence (Kirn, et al., 2017).

Once the data is presented in a table with its themes enlisted, a 'narrative account' is written for each theme. The paragraphs engaging the data are supported by verbatim extracts from the interview transcript, analytical comments are made with reference to other literature. Formulating an analysis and discussion of IPA study results requires emergent themes to be viewed in relation to other studies (Pietkiewicz & Smith, 2014). Kacprzak (2017) observed that IPA's commitment to 'theoretical translatability' is noted in its appeal for its results to be gauged against existing professional and empirical knowledge.

3.9 Trustworthiness

3.9.1 Trustworthiness

Conducting a credible study requires appropriate choosing of methodology to adopt from data generation to data analysis and findings. Orientation is the involvement of the researcher in the world of the research participants and their stories. Strength refers to the convincing capacity of the text to represent the core intention of the understanding of the inherent meanings as expressed by the research participants through their stories. Richness is intended to serve the aesthetic quality of the text that narrates the meanings as perceived by the participants. Depth is the ability of the research text to penetrate down and express the best of the intentions of the participants (Kafle, 2011).

In hermeneutic phenomenological research, it is important to have an appropriate rhetoric. Rhetoric refers to the effectiveness of speaking and writing style. The style of language used in phenomenological research can have an effect in expressing participants' views as intended by the participants themselves. Thus, Kafle (2011) proposes the use of language with a tone of informality, 'with idiographic expressions full of adages and maxims' (p. 6) as the most suitable for hermeneutic phenomenological research.

To ensure reliability of data collected for this study, data collected is handled with confidentiality following the standard norms of data management. Data protection is an integral part of data management (Arifin, 2018). The data collected from participants in this study is stored in encrypted devices with password known only by myself. Audio records are listened to using headsets, if working in a public area and transcribed using a laptop with a password that is not shared with anyone.

It is important to protect human subjects in all research; the nature of a qualitative phenomenological study makes this protection even more important as the nature of the study seeks to understand human experiences. Arifin (2018) stresses that consent and voluntary participation of participants are paramount in qualitative research, and participants must be made aware that they the freedom of choice to withdraw at any stage of the research from participation. Assurance of anonymity and confidentiality was given and honored upon signing of consent forms by participants in this study.

Ethical approval was granted by the relevant body and only upon receipt of a go ahead was the primary data collected from participants.

Researchers should engage in research not only to produce knowledge but also to make positive change in the lives of those who participate in research, change that the participants desire, and articulate for themselves. To improve the study presentation of teachers' experiences and trustworthiness throughout this study, deeply introspect about my feelings to manage them in pursuit of main objectives of this study. I state explicitly my subjective views and biases in the reflection of own experience section of chapter four, this is done to control my prior knowledge from contaminating the research findings. Hermeneutic phenomenology scholars make the presupposition that research framed within the theory cannot eliminate their experiences, preconceptions, and prejudices, as they are central while analysing data, however, they may engage in 'a process of explicating assumptions and preunderstandings' (Lauterbach, 2018, p. 2889). An awareness of the role of the researcher thorough the research process is of paramount importance.

In ensuring my research is accurate all interviews conducted are audio recorded to transcribe and make the data generated more accurate. Upholding of high ethics in phenomenological research requires strict adherence to confidentiality and allowing research participants to know the findings of the study (Abakpa, Agbo-Egwu & Abah, 2017). Ethical considerations are made in terms of the school principal granting permission to conduct research at the chosen sites, and transparency with the teachers involved in this study. No real names of participants are used, and participants were given ascent and consent forms to fill out and sign. These forms indicate the participants' consent to participate this study, respond to interview questions and allow for lesson observations. The forms are sourced from the University of Kwa-Zulu Natal, the principal and participants are aware of what this research will require from them and understand that participation is voluntary, and they reserve the right to withdraw from this study at any point.

3.9.2 Credibility

To maintain rigour in a phenomenological study, data collection methods and procedures ought to be clearly defined (Patton, 2002). In-depth interviews following a semi-structured format have been proven effective in hermeneutic phenomenology to

lay bare deep underlying experiences of participants that cannot be achieved through other methods (van Manen, 1990). The adopted techniques for collecting data are selected on their potential for un-earthing varying kinds of data that shed light on 'different perspectives and insights' (Rubin & Rubin, 2012). Making use of more than one method of data collection enables the study to achieve triangulation and ensures the validity of data obtained, thus improving the credibility of the findings of the study. Moreover, truthfulness and faithfulness of data obtained from research participants are obtained by sharing verbatim interview transcripts with participants for verification and validation of accuracy (Ramsook, 2018).

3.9.2 Transferability

At the centre of an IPA study is the production of verifiable and transferable findings from credible data gathered using sound data collection methods. It is essential for the researcher to place on guard their personal biases and experiences from contaminating the 'lived experiences' of the research participants. In pursuit of sound research methodology necessary for achieving the study's objective, the researcher adopts only the tactics 'that will leave no stone unturned' in investigating the experience under focus (Alase, 2017, p. 17).

There appears to be consensus among most qualitative researchers that findings are not generalizable because of the uniqueness in context, varying perspectives held by participants and the particularity of a phenomenon under study. However, the transfer of results from another study to establish the extent to which it shares similarities with another environment, or another study conducted under similar context. For researchers to undertake transference with reasonable confidence, it is important for that study to share sufficient information about the context, data collection methods, findings and conclusions drawn (Ramsook, 2018).

3.9.3 Dependability

Dependability of a study is anchored on its consistency and reasonable stability of its outcomes across time even if conducted by different researchers, methods adopted should allow for the replication of the study with ease. The dependability of the study allows for detailed description of all steps followed in conducting the study, such that its structure and design can withstand scrutiny as the researcher's position

is clearly outlined. A dependable study ought to 'demonstrate a sense of completeness so that the findings remained consistent and could be contextually replicated' (Ramsook, 2018, p. 20).

3.9.4 Confirmability

The findings of the study are checked against various studies conducted in similar context, investigating closely related phenomenon and policy documents on the subject matter is important for drawing similarities and minimizing preconceptions from overshadowing valid outcomes (Ramsook, 2018).

3.10 Ethical issues

Ethical handling of data is crucial when conducting a credible study. This involves the secure storage of transcribed data, storing it in a password locked computer in an encrypted format whose access is limited only to the researcher. All data is stored for reference until the study is complete as some aspects of it may present unique cases or outlier scenario worth reporting on (Ramsook, 2018). Upon transcribing the data from audio and video recording, the phenomenological researcher must destroy the audio and video recording by deleting them from all devices (Alase, 2017). However, given the nature of this study's undertaking towards a Master of Education qualification in the University of KwaZulu-Natal, the deletion of audio and video recording shall follow university policy on data management and storage timelines while adhering to strict data protection and safety, including upholding confidentiality of the participants in this study.

3.11 Methodological limitation of the study

The limitations of data reported on personal accounts and reflection of participants range from selective memory, telescoping, attribution and exaggeration. Selected memory leaves the participant prone to a state of not recalling some of the events that happened in the past. Telescoping occurs when the participant confuses event occurrence times, recalls an event as occurring at a time that is may have not occurred. Attribution as a side-effect of self-reported data takes place when the participant attributes positive occurrences to self yet discards negative events to external forces. Exaggeration resulting from personal accounts alters the data as

events are purported as more or less significant than other data may suggests (Ataro, 2020).

3.12. Summary

This chapter has outlined the methodological framework of this phenomenology study. As a form of qualitative research, Interpretative Phenomenological Analysis (IPA) was chosen as a paradigm underwhich the study is conducted. The sampling procedures recommended for phenomenological studies were followed, purposively selecting a sample of three mathematics teachers teaching in rural high schools in KwaZulu-Natal, Ndwedwe. Their experiential accounts are collected using one-on-one semi-structured interviews and a single lesson observation of them teaching measurements. All methodological guidelines prescribed for an IPA study were outlined in this chapter, ethical considerations in line with conducting phenomenological research are presented and followed.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1. Introduction

The previous chapter laid out a comprehensive description of the research design and methodology in keeping with IPA studies. As the previous chapter presented key methodological principles in line with IPA, it included a detailed guide on how the data gathered from the three participants of this study is handled and analysed. This chapter begins by making a personal experience reflection, followed by participants' profiles and a presentation of the data from interview transcripts in a table format with direct quotations serving as evidential record for the emerging themes and superordinate themes. In keeping with IPA data analysis, a single case is presented and analysed thoroughly before moving on to the next case. A textural description is provided for each case with verbatim quotations from the transcripts to shed light on what is the experience, followed by the structural description which gives explains the context under which the phenomenon occurs, and a write up on both the textural and structural description in a long paragraph form provide the essence of an experience. A presentation of a single case at a time is in keeping with IPA data analysis as outlined on the previous chapter. Lastly, a cross case analysis is undertaken, at this stage the data is viewed against existing literature and reporting is done on converging and diverging themes.

4.2. Personal Reflection

I am a mathematics teacher with four and a half years of teaching experience in a rural high school. When I began my teaching career, I had never been in a rural school, but I had done my last teaching practicals in a township school with isiZulu as the home language of most teachers and learners at the school. I first noticed when I was doing my teaching practicals in the township school that learners would respond to questions or make contributions to classroom talk using their home language, isiZulu, even as I used English to ask the questions most would respond in their home language. Being an isiZulu home language speaker myself, this did not present me with any challenges as could understand what they were saying. The use of isiZulu by

learners in a mathematics classroom was again encountered in a rural high school in which I was teaching.

At one of my first one-on-one meetings with my departmental head during my first year of teaching, I remember him advising me to use isiZulu when I am teaching learners at grade 9, because, he said, most would not understand me if I taught using English most of the time. I had already began using isiZulu, although only on few instances. Learners in the classroom used isiZulu the most, however, its use would be to communicate everything, including the subject content they learned. I noticed that learners would make reference to mathematical operations as I taught them in class, even as they engaged in mathematical talk using their home language. Learners would pass mathematics with flying colours using both isiZulu and English to learn mathematics, as I would code switch without noticing at times, but some would still find it challenging. I do not plan my language use in the classroom, it is all spontaneous as I teach mathematics using its terms without translation, and learners also follow on how I teach them. What also struck me during my early years of teaching was the low level of prior knowledge of learners at the school in which I teach.

4.3. Data Presentation

The interviews were conducted on a one-on-one arrangement with each of the participants at their respective schools where they teach. The interviews were semi-structured and conversational, allowing for the participant to express or narrate their experience as per their recollection, while I also try to make sense of the participant's experience according to them. The interview language preference of the participants was isiZulu, this was made easy by the fact that I am also an isiZulu native language speaker. Each interview was transcribed and translated to English, the translated interview transcripts were shared with the participants to confirm if the translated version represents their experience as shared. The interview data is transcribed and presented as Appendix A. Reference to interview data is made easy by a line numbering system.

A presentation of data from lesson observations is on Appendix B. Pseudonyms Mr Nothile, Mr Legend and Mr Mathonsi are used in keeping with the requirements to maintaining anonymity of participants. The mathematics lesson observation was for measurement in grade 11, with a video recording of Mr Nothile and Mr Legend as they

presented their lessons in their respective schools and an observation schedule was completed later. Mr Mathonsi's lesson on measurement was observed without video recording, but notes were taken during the lesson. The data from lesson observations is used in the analytical process to corroborate and draw my attention to other aspects of participants' experiential accounts which require the development of additional questions for clarity.

The data from interview transcripts is presented in a table for each of the three participants, followed by a textural description supported by verbatim quotations from transcript, reference line number and table is provided for reference. The experiential account is presented in a long paragraph to provide the essence of each of participant's experiences, with a focus on an individual account, juxtaposed with data from lesson observations for contextual conditions giving rise to each teacher's experience. A table is used to present interview transcript data for each of the three participants. Data is presented in three tables, table one presents Mr Nothile, table two presents Mr Mathonsi and table three presents a table with emerging themes from Mr Legend. Each table with emerging themes is presented, followed by a textural and structural description, and a long paragraph for each participant, before moving on to the next data for each of the three participants.

Table 1: Themes emerging from interview with Mr Nothile

Descriptive/Frequently used	Linguistic/key words (interview transcript)	Conceptual comment	Emergent Themes	Superordinate Themes
<p>Home language learning background</p> <p>Sole use of English unworkable for context</p> <p>Fear of being ridiculed</p> <p>Lack of English fluency discourages participation</p> <p>Relatability of maths in isiZulu</p> <p>Code-switching? (Bilingual)</p> <p>Teaching for assessment</p>	<p><i>learners who from primary school were taught in isiZulu 125</i></p> <p><i>teaching in English was leading to losses in learning 126-127</i></p> <p><i>they are afraid 206</i></p> <p><i>they do laugh at each other 207</i></p> <p><i>in English, I notice that there are terms that limit their expression 190</i></p> <p><i>could easily understand their meaning when taught in isiZulu 128</i></p> <p><i>confuse reflection with inverse, so I try to simplify the meaning and applications of such terms in isiZulu 134-135</i></p> <p><i>I used isiZulu in my teaching, I used both isiZulu and English 129</i></p> <p><i>they are assessed in a paper written in English, it is not written in isiZulu 136-137</i></p>	<p>He finds learners language of learning have always been isiZulu</p> <p>Using English as a sole medium of instruction did not yield satisfactory results</p> <p>Fear of being made fun of and ridiculed by peers discourages learners from participating using English</p> <p>Meaning of mathematical terms simplified by isiZulu explanation for easy understanding</p> <p>Clearing out misconceptions and confusions is done using his learners home language</p> <p>Recognises the importance of using both home language and official medium of instruction language, this he does to equip his learners for assessments</p>	<p>From primary school they were taught in isiZulu</p> <p>Sole use of English impedes maths learning</p> <p>IsiZulu use for simplified explanations</p>	<p>IsiZulu home language and mathematics teaching</p>

<p>Participation</p> <p>Confidence</p> <p>IsiZulu to boost confidence</p>	<p><i>whoever is explaining do so in isiZulu, a language they feel most comfortable with 189-190</i></p> <p><i>you see them loose confidence 192</i></p> <p><i>in isiZulu you can observe them regain their confidence 193</i></p> <p><i>many hands rising when their peer responds using isiZulu 208</i></p> <p><i>they now wish to share their thoughts as an opportunity is presented to share in isiZulu 210-211</i></p>	<p>Creating a learning environment that encourages participation is allowing them to engage in their home language.</p> <p>He attributes home language use to his learners' confidence in communicating mathematical procedures and solutions</p> <p>Allowing mathematics to be communicated using isiZulu encourages participation</p> <p>It becomes easy for learners to answer in isiZulu</p>	<p>IsiZulu encourages increased participation</p>	
<p>Overcrowded classrooms</p> <p>Inability to attend to all</p>	<p><i>they are many 421</i></p> <p><i>in a rural area, you teach 80 learners 408</i></p> <p><i>duration of the lesson becomes one second 403</i></p> <p><i>easy for a learner to dodge 422</i></p> <p><i>there are always learners in need of special attention 404-405</i></p>	<p>Attributes overcrowding to rural context.</p> <p>Adverse effect of teaching in an overcrowded class is insufficient time to reach every learner</p> <p>His learner's mastery of maths varies, with some needing more attention than others.</p> <p>The number of learners in his maths class does not allow for close individual assistance to be given</p>	<p>High learner number in classroom affects individual learner attention.</p>	<p>Overcrowded - maths classrooms</p>

High learner numbers and assessment	<i>with a red pen wishing to give assistance to all of them 410-411</i>	His use of a teacher centred method is in response to an overcrowded classroom.	Overcrowded classrooms dictate use of teacher centred method	
Teacher centred approach	<i>I am forced to use a teacher centred approach 414</i>			
Mathematical language	<i>they use isiZulu with mathematics terms 201</i>	IsiZulu language used for communicating mathematics, mathematical terms used. Mathematics terms taught as per textbook definition.	IsiZulu and mathematics	Teaching mathematics
Questioning	<i>they will respond by saying 'derivative is a gradient at a point' 203</i>			
	<i>I accommodate all of them by emphasising more on basics 266</i>	Teaching focus on basics for all learners to have a solid foundation		
	<i>questions-based teaching 270</i>	Teacher centred method using questioning.		
Extra-tuition	<i>finish the syllabus 300</i>	Teaches all the syllabus for all to acquire some grasp of basics. Creates additional teaching time.	Teaching and learning time	
	<i>begin extra classes 399</i>			
Mixed method	<i>enough time for revision 304</i>			
	<i>we use a teacher centred and a learner centred approach 185</i>	Incorporation of learner centred method by allocating tasks to groups, allowing learners to drive the lesson.		
Collaborative learning	<i>arrange them into groups 195</i>		Teaching strategy	
	<i>discuss a particular section 196</i>			
Participation	<i>teacher centred approach is based on questioning as a strategy 198-199</i>	Teacher centred method through questioning.		

	<p><i>learner centred approach, I pass chalk to one of my learners 415</i></p> <p><i>their lack of reading properly 294</i></p> <p><i>learner to explain to the lost learner 418</i></p>	<p>On assessment, lack of sufficient reading exposure.</p>		
<p>Centrality of teacher's role</p> <p>Calculator primary resource</p> <p>Resource management challenges</p> <p>Resource lack leads to differentiated learning</p>	<p><i>the main material here is you as a teacher in rural areas 234</i></p> <p><i>resources you will find here are protractors 235</i></p> <p><i>it is very common for calculators to get stolen 239</i></p> <p><i>they do not afford it 240</i></p> <p><i>to solve a problem without relying on a calculator 243</i></p> <p><i>find solutions on the calculator 247</i></p> <p><i>they will learn differently 254</i></p>	<p>Sees himself as the primary source of mathematics for his learners</p> <p>Cites only protractor and calculator as the only resource accessed by some of his learners</p> <p>Others do not even have the basic materiel such as a calculator, 'they do not afford it'</p> <p>He teaches other strategies of solving to bridge the calculator gap, however, this he does to bridge the resource gap.</p>	<p>Teacher as a primary resource</p> <p>Resource challenges</p>	<p>Mathematics Resources</p>
<p>Observes demotivated learners</p>	<p><i>a rural area such as this, do not care much about education 296</i></p> <p><i>they simply do not see its value 141</i></p> <p><i>no encouragement even at home 142</i></p>	<p>Laments general lack of interest in education</p> <p>Attributes lack of motivation at home to his learner's lack of interest in maths</p>	<p>Attributes lack of motivation to rural background</p>	<p>Motivation</p>

Lack of role models	<p><i>home chores awaiting them 297</i></p> <p><i>they are tired and go to sleep 298</i></p> <p><i>their background is what affects 295</i></p> <p><i>there is no one they look up to from home 143</i></p> <p><i>they have never seen such jobs 147-148</i></p>	<p>His learners are inundated with home chores after school, this is attributed to home duties</p> <p>Perceived lack of employment opportunities also plays a role in discouraging his learners from committing themselves to maths</p>	Lack of home support	
Lazy	<p><i>he or she has forgotten 150</i></p> <p><i>they do not do their schoolwork 150</i></p> <p><i>learner does not practice daily as expected 152</i></p> <p><i>their homework, it will be the same as their friend's 153</i></p>	<p>Forgetfulness of his learners here is attributed to their lack of studying</p> <p>Producing the same homework solutions is attributed to copying and not necessarily working collaboratively</p> <p>Poor attitude towards maths as a subject an indication of lack of intrinsic motivation</p>	His learners' poor attitude towards maths	
Peer pressure	<p><i>they came here following a friend 157</i></p>	<p>Poor attitude towards maths as a subject an indication of lack of intrinsic motivation</p>		
Passion leads to competence	<p><i>when a learner loves mathematics that they will grasp it 429-430</i></p>	<p>Love for the subject will result in higher work ethic and thus improved performance.</p>	Positive motivation	
Voluntary participation	<p><i>They like saying 'Sir, we wish to go to the front' 186</i></p>	<p>When motivated, learners participate voluntary in mathematics classrooms.</p>		

4.3.1. Mathematics teaching experiences: Mr Nothile

Textural Description of emerging themes from Mr Nothile's experiential accounts. Emerging themes from interview transcript data in Appendix A is presented in Table 1, pages 50 to 54.

4.3.1.1. *isiZulu home language and mathematics teaching*

Extract from interview with Mr Nothile:

...from home to primary schooling based in a rural community, which means there are learners who from primary school were taught in isiZulu, everything had been taught in isiZulu. So, much of my teaching in English was leading to losses in learning as they could not understand some of the words used in English but could easily understand their meaning when taught in isiZulu. So I can say that during the following year I used isiZulu in my teaching, I used both isiZulu and English (line 124-129).

i. From primary school they were taught in isiZulu

The experience of Mr Nothile with his mathematics learners' classroom interaction favouring isiZulu can be traced to learners' early maths learning experience in their home language. His learners' relatability to learning in their home language begins at their primary schooling, he states that his learners *from 'primary school were taught in isiZulu' (line 125)*, which is also their home language (table 1, p. 50). This language of learning experience of his learners appears to be the most effective in facilitating maths discussions.

ii. isiZulu encourages increased participation

The apparent preference of learning in isiZulu is reported to encourage participation of learners in mathematics lesson discussions. His learners' increased participation is dependent on their freedom to use their home language to communicate mathematical solutions. Moreover, as Mr Nothile narrates his experience of his learners during a maths lesson, he finds their level of participation increases when classroom engagements are done in learners' home language. It is apparent from Mr Nothile's accounts that his learners' choice of isiZulu language to communicate mathematics is done out of lack of proficiency in the English language, and the subsequent ridicule that could be suffered by those who dared to speak broken English in a maths classroom. His learners' participation in their home language is because *'they are afraid' (line 206)* of not being able to communicate their thoughts

well, and because they *'laugh at each other'* (line 207). Here, Mr Nothile suggests that learners fear lapses in their English fluency in communicating mathematics, and their laughing at each other is because of English language and not necessarily mathematics being communicated as its communication is openly done in isiZulu (table 1, p. 51).

A deliberate strategy by Mr Nothile in facilitating mathematics learning is evident in his account to allow learners explaining a mathematical concept or solution to *'do so in isiZulu, a language they feel most comfortable with'* (line 190). Mr Nothile is particularly concerned by the learning environment he creates for his mathematics learners; he places particular focus on creating conditions for vibrant learner engagements. His adoption of isiZulu in his mathematics classroom achieves the desired participation engagements, he observes *'many hands rising when their peer responds using isiZulu'* (line 208) and allowing his learners to use their home language in a mathematics classroom helps them *'regain their confidence'* (line 193).

This is evident in Mr Nothile's narration of experience of his learners *'lose confidence'* (line 192) when required to contribute to a mathematics discussion in English. This is because *'there are terms that limit their expression'* (line 190) when required to make their mathematical contributions in English. Mr Nothile experienced teaching purely in English was resulting to *'losses in learning'* (line 127), but recognises the importance of using both English and isiZulu when teaching learners whose home language is isiZulu because *'they are assessed in a paper written in English, it is not written in isiZulu'* (line 137). Here, Mr Nothile's use of both isiZulu and English when teaching mathematics is aimed at equipping learners for assessments which are written in English, while fostering improved understanding through simplifying mathematics lessons by using the home language of learners (table 1, p. 50). Mr Nothile's incorporation of English into his mathematics classroom is aimed at preparing learners for assessments, which are written in English.

iii. *IsiZulu use for simplified explanations*

Mr Nothile's use of isiZulu for his mathematics lessons is most resourceful when explaining the distinction between mathematical concepts whose applications are closely related and where misconceptions are likely to occur. Concepts such as *'reflection'* and *'inverse'* (line 134), he simplifies their meanings and procedural

applications in isiZulu (table 1, p. 50). Recognises the importance of using both home language and official medium of instruction language, this he does to equip his learners for assessments. Clearing out misconceptions and confusions is done using his learners' home language. The use of learners' home language thus allows for the focus to be on the mathematics rather than on language, resulting in learners understanding of mathematical concepts '*meaning when taught in isiZulu*' (line 128).

4.3.1.2. *Overcrowded mathematics classrooms*

Extract:

Another class I have has 80 learners I teach alone because we are here in a rural area... If I move around the class with a red pen wishing to give assistance to all of them, after seeing 6th learners and looking at the time I feel I need to move, as I conclude with the 8th learner and again check the time, I find time has run out (line 408-413).

i. Overcrowded classrooms dictate use of teacher centred approach

As Mr Nothile laments overcrowding as a challenge, he shares that this plight is not unique to him but is a problem commonly experienced in rural schools. Shifting to his own teaching experience, he exclaims; '*you teach 80 learners*' (line 408) as he quantifies his average classroom size (table 1, p.51). This is followed by an emphasis '*they are many*' (line 421) as he continues to give an account of his daunting task. The difficulty experienced when teaching mathematics to many learners in single classroom leave Mr Nothile feeling compelled to use a teacher centred approach. To indicate how his situation leaves him without many options on his teaching approach, his use of a teacher centred approach is one which he is '*forced*' (line 414) to undertake to reach his lesson objectives and cover the syllabus (table 1, p. 51 – 52). The overcrowded classroom situation limits his teaching approach choices during the lesson.

ii. Overcrowded classroom does not allow for individual learner attention

He bemoans overcrowded mathematics classrooms as limiting his ability to reach each and every learner in need of his assistance within reasonable time. This can be noted in his experiential account on how it is '*easy for a learner to dodge*' (line 422) his attention in a classroom size that is double or triple the number of learners per session with him alone as their maths teacher. In an overcrowded classroom, even

with a desire to reach every learner in a single lesson it is not possible in Mr Nothile's experience, time limitations diminish any hopes of attending to all his learners. His experience over the years has shown him that *'there are always learners in need of special attention'* (line 404-405), a demand that he is unable to meet on the normal allocated time as the *'duration of the lesson becomes one second'* (line 403). He ends up *'with a red pen wishing to give assistance to all of them'* (line 410-411) but overcrowding and time constraints only allow his red pen to assess a limited number of learners per lesson (table 1, p. 51). The number of learners in his maths class does not allow for close individual assistance to be given to each learner.

4.3.1.3. *Teaching mathematics*

Extract:

English, I emphasise that it is important for me to include some terms in my teaching as part of their daily vocabulary, especially in maths there are important terms like 'factorisation', they must know what five ways of factorisation means, they must know the meaning of 'intersection' in functions, so the meaning of such terms must be explained in every way possible (line 130-134)

i. IsiZulu language and mathematical language

For Mr Nothile, his learners' communication of mathematics being in isiZulu does not create any losses in meaning or misconceptions borne from language. This is the case because mathematics terms are used in their textbook form, to support this, he explains that his learners *'use isiZulu with mathematics terms'* (line 201) in classroom engagements (table 1, p. 52). Mr Nothile stresses in his account that teaching mathematics vocabulary is important if his learners are to achieve success in mathematics learning, this is consistent with his highlighted importance for his learners to achieve success in assessments which are written in English. He amplifies this by citing an example of how his learners would respond to a question posed in class of what a derivative is, their response will follow; a *'derivative is a gradient at a point'* (line 203). It is obvious from Mr Nothile's narration of his experiences with teaching mathematics to learners whose home language is isiZulu that mathematical definitions are taught using textbook definition (to satisfy assessment requirements), while preserving the role of isiZulu as a language to communicate and simplify the mathematical language for easy understanding. IsiZulu language is used to

communicating mathematics, the teaching of mathematical terms and concepts is done to satisfy their textbook definition.

ii. *Teaching strategy*

The classroom teaching approach, according to Mr Nothile's experiential account, employs both the *'teacher centred and a learner centred approach'* (line 185). The teacher centred approach is undertaken as a strategy to respond to overcrowded maths classroom (table 1, p. 52). His experience teaching mathematics to isiZulu home language speakers in a rural high school places him in a situation where the high learner number per classroom lead to him mostly using a *'questions-based teaching'* (line 270) approach. Mr Nothile's use of a question-based teaching is also aimed at equipping his learners for assessments, as his use of questions-based teaching familiarises learners with how questions will be set in assessments.

In addition, *'teacher centred approach is based on questioning as a strategy'* (line 198-199). This strategy is supplemented by the incorporation of a *'learner centred approach'* wherein *'I throw chalk to one of my learners'* (line 415) for them to lead a solution formulation, simplification or procedural steps when solving for whole class learning. Despite contextual conditions compelling Mr Nothile to use a teacher centred approach, he still strives to involve learners in their active learning by *'arranging them into groups'* (line 195) and allocating tasks for completion per group, and whole class discussion of *'a particular section'* (line 196; table1, p. 52). In Mr Nothile's pursuit of including all his learners during the maths lesson, he delegates a learner who demonstrates an improved mastery of a concept under study *'to explain to the lost learner'* (line 418). This explanation between learners is aimed at reducing maths talk to learner-to-learner maths language understanding.

iii. *Teaching and learning time*

Mr Nothile tells of how he teaches by *'emphasising more on basics'* (line 266) as he makes strides to cover the syllabus in time. Directing his focus on basics during the teaching and learning time is intended at equipping his learners with the necessary foundation for them to acquire the minimum pass at the very least. However, his efforts are not always successful, his reference to *'try to make them pass'* (line 274) indicate that his learners' good performance is an ongoing endeavour, whose pursuit is always subject to consistent effort until the year ends. In Mr Nothile's teaching experience,

'finishing the syllabus' (line 300) becomes important for his learners to be exposed to all the topics and score some marks in sections they have learned (table 1, p. 52). Teaching mathematics in order to complete the syllabus allows Mr Nothile to *'begin extra classes'* (line 399) which are crucial for his learners to have enough practice of mathematics at school with him facilitating continued learning during extra classes, and also have *'enough time for revision'* (line 304).

4.3.1.4. Teaching resources

Extract:

In a rural area such as this, we do not have learning tools as things stand. In all honesty the main material here is you as a teacher in rural areas, you are everything a rural learner needs (line 233-235).

i. Teacher as a primary resource

Teaching mathematics to learners in a rural high school has its own challenges, according to Mr Nothile as he laments *'learning tools'* (line 233) shortage. Moreover, in Mr Nothile's teaching experience he has seen his role take central importance in the learning of mathematics by his learners. His reference to himself as the *'main material'* (line 234) suggests his experience of teaching his learners require him to teach every section without the necessary resources and make a plan of covering gaps created by learning tools shortage or no availability (table 1, p. 53). In his experience-based assertion, Mr Nothile's view of his role in teaching mathematics to his learners is heightened as he apportions scarcity of resources to context of rurality, thus he sees himself as *'everything a rural learner needs'* (line 235). This experiential observation places him in a position where his teaching strategy is crafted in a way that covers the resource shortage gaps experienced by his learners and school.

Teaching in a rural high school has presented its own unique resource challenges for Mr Nothile. He makes mention of how a basic tool such as a calculator is not possessed by all his learners in his class. The fact that some of his learners do not have calculators means that his teaching has to be structured in a way that will accommodate all learners in his classroom, his teaching must equip learners without a calculator with skills *'to solve a problem without relying on a calculator'* (line 234) Accommodating all learners in his class dictate that he also teaches those with calculators how to *'find solutions on a calculator'* (line 247), a strategy he concedes

places his learners in a position where they *'learn differently'* (line 254) and the performance of those without is likely to be affected (table1, p. 53). His teaching of other strategies of solving maths problems is aimed at bridging the learning gap created by some of his learners not having calculators.

ii. *Resource challenges*

The challenge of resources in Mr Nothile's experience is such that the only mention of mathematics teaching and learning tool is limited to *'protractors'* (line 235). While recounting the challenges encountered in the classroom, he passionately complains about how rife the theft of calculators is among learners. This theft according to his experience is owing to learners' lack of affordability, as he puts it, *'they do not afford it'* (line 240; table 1, p. 53). This affordability problem then creates another problem of stealing of calculators among his learners in his mathematics classes, a tendency he expressly denounces.

4.3.1.5. *Motivation*

Extract:

Some I find their background is what affects them back at home, some parents, in a rural area such as this, do not care much about education but home chores, so a learner coming from school will find home chores awaiting them, and by the time they are done with these chores they are tired and go to sleep. Those are the kinds of things we are faced with; you end up understanding what affects their lack of time to practice in order to improve (line 295-300).

i. *Attributes lack in motivation to rural background*

Mr Nothile experiences mathematics learners who are discouraged and lacking in motivation. He apportioned the lack of motivation to their rural backgrounds which are not supportive to learners, he makes mention of this reality as *'what affects'* (line 295) his learners. The low levels of development synonymous with rural areas also mean that employment opportunities are low. So his learners lack of motivation also results from the high unemployment affecting rural areas, which in turn renders the motivation of his learners with prospects of better employment opportunities in the future futile because *'they have never seen such jobs'* (line 147-148; table 1, p. 54). This reality has Mr Nothile lament the general lack of interest in education portrayed by some of his learners, and mathematics learning is therefore affected given its nature demanding regular practice in order to improve its mastery level.

ii. *Lack of home support*

In Mr Nothile's narration of his experience with teaching mathematics to learners whose home language is isiZulu in rural high schools, he expresses concern over how the value of education is diminished in learners from their home background. This he observes from his learners' attitude and alludes that there is '*no encouragement even at home*' (line 142). His use of the word 'even' indicates that a general lack of encouragement for his learners elsewhere could be understood, but their home situation destroys the prospects of them receiving motivation and encouragement outside of school. Over the years, Mr Nothile has understood his learners' home situation, given his teaching experience in the area, and identifies a rural way of life as imposing additional responsibilities to his learners in the form of house chores when they get to their homes. His learners are inundated by house chores they are expected complete after school, such that by the time they are supposed to do their mathematics practice '*they are tired and go to sleep*' (line 298; table 1, p. 54).

iii. *His learners' poor attitude towards maths*

Mr Nothile (with a strong passion) narrates a story of how poorly interested in mathematics he finds his learners. The weaknesses noted in mathematics mastery is owing to their lack of '*practice daily*' (line 152) which leads to their forgetfulness of concepts learned the previous day. He shares how his learners '*do not do their schoolwork*' (line 150) as expected, this he appears to be placing a blame on the learners themselves. This poor attitude towards mathematics and lack of motivation is intertwined with peer pressure as they produce the same homework the following day (collaborative learning or outright copying?). Peer pressure among his learners is rife, some, he alludes, '*came here following a friend*' (line 147). This observation is indicative of how some of how carefree some of his learners are about mathematics, or simply do not know why they are studying mathematics (table 1, p. 54). Forgetfulness of his learners here is attributed to their lack of studying. Producing the same homework solutions is attributed to copying and not necessarily working collaboratively. Poor attitude towards maths as a subject an indication of lack of intrinsic motivation.

iv. *Positive motivation*

Mathematics teaching to learners also requires some strategy on instilling love for the subject. The experience shared by Mr Nothile with mathematics teaching is that *'when a learner loves mathematics they will grasp it'* (line 429). His choice of the word *'love'* to express his experiential observation indicates that it was only when his learners have an intimate relationship with mathematics that they *'will grasp it'* (table 1, p. 54). The implication contained in his use of *'will'* when describing the relationship between mathematics love and its understanding by a learner suggests a definite causal effect in his experience with teaching mathematics. This experience by Mr Nothile speaks of the role motivation has on his learners' understanding of mathematics. In addition, when his learners are motivated, they do not need him to point at them to get their contribution in class, this is seen in their requests, as he quotes how they request from him *'sir, we wish to go to the front'* (line 186; table 1, p. 54).

Structural Description (Sd): Mr Nothile

Sd.4.3.1.1. IsiZulu home language and mathematics teaching

i) *From primary school they were taught in isiZulu*

The learners Mr Nothile teaches mathematics come from the same rural area where his school is located. The surrounding primary schools servicing the community are isiZulu home language schools, which mean that the official language of teaching and learning in the lower grades up to middle phase is isiZulu. When his learners arrive in high school, also in a rural community, they are used to learning in isiZulu. Teachers in high school continue to use isiZulu for teaching learners despite the official language of teaching and learning being English. This they do following learners' apparent familiarity to isiZulu, which goes on up to the twelfth grade.

ii) *IsiZulu language encourages increased participation*

The fact that all learners in Mr Nothile's mathematics class are isiZulu home language speakers, from the same rural community, mean that their engagement inside and outside of school is happens in their home language. Given the fact that these learners have always been taught in isiZulu from primary school, they have gotten used to communicating with their home language when learning. In Mr Nothile's lesson observation, learners were asked questions in both isiZulu and English, and all responses were in isiZulu, except for one learner who made their maths contributions

in English. It was noted that learners in his class participated freely, focusing on the mathematics, using isiZulu. Participation which is important for their active learning in the classroom.

The lack of learners' participation in a mathematics lesson when they are required to make their contributions in English, according to Mr Nothile's experience, is noted when some try to engage in English. The fact that learners are isiZulu home language speakers, and they are used to learning in isiZulu make his teaching in English a challenge for his learners. He teaches in both isiZulu and English, this he does to prepare his learners for assessments, which are written in English.

iii) IsiZulu language for simplified explanations

The meaning of mathematical terms is simplified using isiZulu to explain for easy understanding. The adoption of isiZulu as the critical language for simplifying and communicating mathematics by Mr Nothile appears to separate the mathematics from both isiZulu and English. This apparent separation of mathematics placing the subject as a stand-alone discipline, which can be communicated through any language. This was observed during the measurement lesson where learners use of isiZulu when expressing their mathematical ideas resembled the style of explanation used by the teacher. Explanations in isiZulu preserved mathematics concepts as they are used in the textbook, leaving the reference to such terms untranslated by both the teacher and the learners as they explained.

Sd.4.3.1.2. Overcrowded classrooms

i) Overcrowded classroom dictate use of a teacher centred approach

There were more than 60 learners in Mr Nothile's grade eleven mathematics class during the lesson observation. The sitting arrangement of desks resembled an exam setup, with isle inbetween rows, with some double desks occupied by three learners and some isle passages too narrow for him to walk through. This confirmed the experiential account of his teaching mathematics to an overcrowded classroom. He uses a teacher centred approach to facilitate lesson, but mostly uses questioning to involve his learners in the lesson.

ii) Overcrowded classroom does not allow for individual learner attention

The narrow aisle passages in between double desks in a classroom with over sixty learners make reaching some learners seated on desks located at the centre and back of the class inaccessible by Mr Nothile. This makes giving every learner attention impossible within a single lesson of one hour. The almost clustered double desks with narrow passages in between confirmed how easy it makes it for some of his learners to dodge his attention. Furthermore, the time allocated for a single lesson becomes insufficient to assist learners in need of special attention in class.

Sd.4.3.1.3. Teaching mathematics

i) IsiZulu language and mathematical language

Teaching mathematics to learners who are isiZulu home language speakers and a background of learning in their home language from primary school creates a situation where their home language is preserved in the classroom. However, the extent of this preservation of isiZulu as a language of learning depends on the teacher's deployment of language in the classroom. While the school uses English as the official language of teaching and learning, learners' natural familiarity with isiZulu forces the teacher to use their home language to explain concepts and communicate ideas. However, the fact that learners' textbooks and assessments use mathematical language with English is the reason Mr Legend designs his teaching to also focus on teaching concepts to learners as they appear on their textbooks. When isiZulu is used, it is mainly to explain or simplify procedural operations in a language of learners for their easy understanding. In the end, regardless of the language used to teach mathematics, the focus is on the mathematical language, and not language of communication per se.

ii) Teaching strategy

Teaching mathematics in an overcrowded classroom limits the choices Mr Nothile has on the teaching strategies he uses. However, this limitation has developed his ability to utilise questioning as a method of facilitating mathematics learning. To reach learners he is not able to physically reach in class, he poses questions for them to respond. The way he poses questions, interchanging between isiZulu and English, is similar to how they are in assessments and follow steps that would be required from a learner, a strategy aimed at making them familiar with the assessment questioning style.

On visiting Mr Nothile for an observation of a grade 11 lesson on measurement, the overcrowded class situation he had spoke about when giving his experiential account was witnessed. When sharing his experience, he referred to how he involves his learners by throwing chalk for them to lead a chalkboard demonstration. His reference to *'throw'* (line 415) was initially understood as handing chalk to the learner, but on observation it became obvious that he meant it literally as he could not move in-between all the rows. The context which Mr Nothile teaches mathematics in the grade 11 class observed for this study would not allow for learners to be arranged into groups, there simply is no space for a group setup because of the high concentration of learners in the classroom. He clarified that he organises them into groups on Fridays and during extra-classes where he assesses their learning, and also allows them to learn from each other.

Teaching focus on basics for all learners to have a solid foundation and a teacher centred method is undertaken using questioning as a strategy for eliciting responses, for assessment for learning. During the lesson observation on measurements, Mr Nothile incorporated chalkboard diagram demonstrations with models of the cylinder (open and closed) and a rectangular prism (closed and open on one side), using an empty redbull can, a tissue roll's inner core and a rectangular ice-cream container. Commonly noted shortfalls on Mr Nothile's experience with teaching mathematics to isiZulu home language speakers indicate lack of reading exposure or proper reading during assessments by learners. Mr Nothile's allocation of mathematics activities to groups and subsequent allowing of learners to share solutions addresses his challenge of being 'forced' to use a teacher centred method, to a more collaborative learning environment despite overcrowding challenges. Incorporation of learner centred method by allocating tasks to groups, allowing learners to drive the lesson.

iii) Teaching and learning time

The high learner number in mathematics classrooms taught by Mr Nothile present him with a challenge of completing the syllabus on time. To circumvent not completing the syllabus, he focuses on the basics in class, to make sure that all his learners have a grasp of the required skillset to pass. However, the difficulty of completing the syllabus on time with some learners still lacking in understanding is

covered through scheduling extra-classes in order to complete the syllabus and get time for revising with his learners before they write their formal tests.

Sd.4.3.1.4. Teaching Resources

i) Teacher as a primary resource

Operating in a context without much teaching and learning resources places Mr Nothile in a position where he sees himself as the main resource his learner needs. This was demonstrated by his careful selection of resources for a lesson on measurement. Over and above the sketches of a rondavel, capsule (pill) and a half-cylinder joined to a rectangular prism that he requested one of his learners to draw on the chalkboard, he brought to class with him an empty can of redbull energy drink and a toilet paper inner core to demonstrate a closed and an open cylinder. He also used an empty icecream container to demonstrate dimensions of a rectangular prism. Majority of the learners in his class had calculators with them and they were using them during the lesson.

i) Resource challenges

The resource challenges Mr Nothile experience when teaching mathematics could be noted in how he improvises with the models he brings to his lesson demonstrations. Besides calculators on some of the learners' desks and textbooks that some shared, there were no other teaching and learning aids that were noted. The rife theft of calculators by learners indicates the poor background that many of his learners come from, which is the reason he says that they cannot afford calculators.

Sd.4.3.1.5. Motivation

i) Attributes lack in motivation to rural background

The lack of motivation by Mr Nothile's learners, emanating from their home background situation means he has to organise for them to spend more time at school where he can teach them and offer the motivation they need. This time he creates at school is to afford them with an opportunity to practice maths, as he says that some are unable to do it at home. Mr Nothile's lament of the lack of job opportunities suggest that if there were many people from the community employed maybe learners would

be motivated by the prospects of also working after they finish school with a matric pass.

ii) *Learners' poor attitude towards maths*

Upon visiting Mr Nothile for an observation of his lesson on measurement lesson begins his lesson, before even greeting them with a slogan, he leads them as he chants as follows:

Teacher: Now who is the judge?

Learners: The judge is God!

Teacher: Who is the judge?

Learners: The judge is God!

Teacher: Why God?

Learners: Because God decides who wins or loses and not my opponent.

Teacher: Who is your opponent?

Learners: He doesn't exist

Teacher: Why he doesn't exist?

Learners: Because he disagrees to the truth that I speak.

Teacher: Speak the truth!

Learners: Speak the truth!

Teacher: Do the truth!

Learners: Do the truth!

Teacher: Speak the truth!

Learners: Speak the truth!

Teacher: Do the truth!

Learners: Do the truth!

Teacher: Aw, Speak the truth!

Learners: Speak the truth!

Teacher: Do the truth!

Learners: Do the truth!

(Appendix B: Mr Nothile's Lesson Observation Schedule, Summary)

He taught his learners this slogan so that they believed in themselves and God. Its daily chanting is aimed at preparing them for the mathematics lesson and to remind them that it is within them to achieve, and no one else has power over what they can and cannot do. The aim of the slogan is to motivate his learners and change their attitude towards mathematics.

iii) Positive motivation

The motivation of Mr Nothile's grade 11 mathematics learners was witnessed and recorded during the lesson observations conducted for this study, as I entered the classroom with him, there were learners who were at the board explaining mathematics to others seated, while others were working quietly. When confident about mathematics, learners are eager to participate and lead the class in solution formulation on the chalk board.

Long Paragraph: Mr Nothile's Experience

Learners in Mr Nothile's mathematics class come from the surrounding primary schools in the rural community and have been taught in isiZulu from the day they started their schooling. In the teaching experience of Mr Nothile, learners in his mathematics classroom prefer using their home language when making contributions in class, an environment which he ably creates for them to participate freely. He mostly uses isiZulu to explain the meaning of mathematical concepts and explain the procedure to be used.

While his teaching allows for learners to actively engage and participate in isiZulu, his inclusion of English when teaching is aimed at equipping learners for assessments. Teaching mathematics in a rural area presents Mr Nothile with a challenge of overcrowded classrooms. In his mathematics class, the learner numbers go up to 80 learners in a single class. His overcrowded reality leaves him with limited strategies for teaching, which forces him to use a teacher centred method. The setup of desks compounds the problem of accessing his learners who are seated in places he is not able to reach. While his learners use isiZulu among themselves and to communicate during maths learning, he stresses the importance of teaching them 'vocabulary' for them to know the definitions of concepts. He teaches them concepts as they are provided for in their textbooks and assessments, this he does for his learners to get know the mathematical language.

IsiZulu is used to simplify explanations, and English is used for him to train his learners to be able to answer questions during assessments. He resorts to a questions-based teaching as a strategy when using a teacher centred approach due to overcrowding in mathematics classes. The line of questioning he uses in class probes learners understanding and prepares them to be familiar to the language used in examinations.

The setup in the classroom does not allow for easy movement of Mr Nothile and his learners. It was also not obvious how he arranges learners into groups because of the high concentration of learners seated in double desks, until he explained how he creates additional time for a more collaborative learning that is learner centred. He prefers teaching that focuses on basics in response to the mathematical level that most learners operate in and is aimed at creating a foundation from which learners can expand their knowledge when more time is allocated during extra classes. He conducts extra-classes to make sure that the syllabus is covered in time and to allow for more practice on sections already taught, revising before the examination. Mr Nothile's view of himself as the main resource when teaching mathematics to learners in a rural high school could be observed on how he facilitated his lesson. The demonstrations he used were all improvised from things that could be passed as litter. Things like an empty redbull can, empty ice-cream container and a toilet paper roll's inner core, for his lesson demonstrations indicate how he plans his lesson to bridge the resource gap. Learners' attitude is key according to Mr Nothile's experience, he presents an indepth understanding of his learners as he experiences their lack of motivation which he identifies as based on their background.

The rurality of the context that his learners come from is defined by low opportunities and no home support for his learners to be motivated. He designed a slogan, which he chants daily with his learners before the beginning of every lesson in an effort to motivate his learners and get them ready to learn mathematics. He places a strong emphasis on the need for motivation, which he argues that when learners have the right attitude and motivation to do maths, they work without the supervision of the teacher. Also, their classroom participation happens naturally as they all wish to display their skills in class.

Table 2: Themes emerging from interview with Mr Mathonsi

Descriptive/Frequently used	Linguistic/Key words	Conceptual Comment	Emergent Themes	Superordinate Themes
Learners' adult responsibilities No parental support No one to help at home	<i>child headed home 826</i> <i>background is not favourable 836</i> <i>who are poor 896</i> <i>There is no one who can assist 1039</i>	Some of his learners are responsible for far more than their schoolwork, their responsibility at home is that of an adult while they are still of school going age. Laments his learners' state of poverty, and designs instruction to accommodate all. (resources such as calculators) His learners have a challenge of receiving mathematics help at home.	Poverty stricken and orphaned mathematics learners No mathematics help at home	Learner background
No calculators Borrow and learn Fortunate	<i>does not have one (calculator) 884</i> <i>borrow a calculator 895</i> <i>luckily...we have a sponsor 898</i>	For mathematics resources such as calculators, no immediate support to buy the calculator from home affects learning Teaching his learners to borrow calculator from others is aimed at showing the importance of using a calculator and being responsible for their own learning.	Mathematics resource shortage Coping with Resource shortages	Mathematics Resources

		His expression of appreciation for private company assistance with basic resources for learning indicative of the impact this help has on his learners.		
Adapting teaching to reality	<i>changed how I teach 833</i>	Awareness of learners' situation led to him changing strategy in teaching mathematics	Awareness of learner situation	
Teaching design to accommodate all learners	<i>give special attention 838 839</i>	His teaching to learners with demoralized learners is tailored to accommodate their lack of proficiency.		
using calculators	<i>give them basic problems 852</i>	Ability to use a calculator is highlighted as necessary for mathematics learners.		
Prior knowledge	<i>develop their calculator usage skills 896 897</i>	Revisiting of previous grades work before teaching grade relevant content.		Teaching mathematics
Revisiting previous grades work	<i>back to recapping 939</i>	Sees his revisiting previous grades content as being compelled by learning deficiencies of his learners.	Insufficient Prior-knowledge	
	<i>forced to teach 942</i>			

Variety of teaching methods for maths learning	<i>teach...different methods 943</i>	Recognition of importance of exposing learners to different approaches aimed at accommodating their learning needs.		
Open discussion and questioning	<i>at the end...platform to ask 944</i>	Highlights the value of mathematical engagements, through questioning.	Mathematics teaching strategy	
Explanation	<i>clearer explanation 945</i>	Use of explanation to respond to questions during engagements		
Knowledge progress	<i>move from unknown to know 948</i>	Objective of his teaching is to teach learners to know mathematics		Teaching mathematics
Revision	<i>revise, do revision 1103</i>	Stressing and repeating revision indication of his belief in the strategy of preparing for exams by revising with learners.		
Extra-tuition (classes)	<i>extra-classes on weekends 1107</i>	His study times before and after school are aimed at creating the time, space and support needed for maths work.	Teaching and learning time	
Teaching for assessment	<i>Study sessions 1050</i>	Allocated school hours insufficient for teaching, this necessitates arranging for extra-classes.		
Standard study sessions	<i>Remain at school 1049</i> <i>stick to the point...know your story 1162</i>			

Maths language in assessments	<i>assessment...not set in isiZulu 976</i>	Teaching and classroom engagement focuses on mathematical language, this in preparation for assessments.		
Rigorous assessment	<i>Assess...to the fullest 1168</i> <i>not English...but mathematical language 978</i>	Uses assessment to teach so that his learners know what is expected of them during an examination.	Maths assessment are not set in isiZulu	
Mathematics vocabulary	<i>I stress the importance of... maths terms 1011 1012</i>	Mathematical language and terms are central to maths learning, different from English language.		
Morning and afternoon study sessions	<i>they work as individuals 931</i> <i>cannot work alone 932</i>	Here, reference to working as individuals refers to individual effort within a group.		
individual work within pair/group	<i>do in groups 952</i> <i>Different levels of cognitive abilities 1173</i>	Appears to favour collaborative learning, with individual learner actively engaged within a collective	Teaching learners to work collaboratively	
Group work				
Learners remain at school to do maths afterschool	<i>Brightest learners...assist peers 1180</i>	Knowledge of his learners varying abilities allows for his assessment design to cater for all their learning needs according to what they can handle. With those who		

Pairing of learners to assist each other		understand better explaining to others during class.		
Poor performance	<i>Performing so dismal 851</i>	Lack of energy and productivity of learners owing to unfavourable background at home.	Lack of motivation	Motivation
Lazy	<i>is lazy 851</i>			
Perseverance	<i>always strive 823</i>	The teacher sees his role as one that is a continuous effort to educate his learners, regardless of circumstances.	Devotion of teacher	
Understand	<i>understand a learner 843</i>	Knowing his learners' situation is integral to his teaching design.		
Build	<i>develop their sense of responsibility 895 896</i>	In his instruction for those without calculators to borrow is aimed at developing them to be responsible.		
Collectively instil discipline	<i>we are strict 1062</i>	Reference to 'we' in this instance is an indication of a collective effort in instilling values in learners.		
Capable learners	<i>learner possessing more knowledge</i>	Talented learners' engagements contributions sometimes exceed those of teacher.		

4.3.2. Mathematics teaching experiences: Mr Mathonsi

Textural Description of emerging themes from Mr Mathonsi's experiential account. Transcribed interview data from Appendix A are presented in table 2, pages 71 - 75.

4.3.2.1. *Learner background*

Extract:

first find out about a learner's situation, as it may very well be that their lack of participation, lack of performance in class is as a result of some things in their background, their background is not good. Their background is not favourable, so those kinds of things do happen, so such a learner must not be treated harshly (line 833-837).

i. Teaching mathematics to poverty stricken and orphaned learners

The home background of some of Mr Mathonsi's learners places them in a position where they are sometimes not able to perform well in mathematics. He tells of how some are the only ones left to take care of their siblings at home, which results in those learners not being fully attentive in class because of the amount of responsibility that they have outside school as they lead '*child headed*' (line 826) households. Lack of parental support for some of his learners affects their learning in class, as this would often result in them not participating actively in class. Mr Mathonsi attributes this to learners' home situation, which '*is not favourable*' (line 836) for a school going learner (table 2, p. 72). As part of understanding his learners' background, he fills in these gaps by being caring and compassionate when dealing with such learners. He teaches them to be responsible, especially those '*who are poor*' (line 896) when it comes to mathematics learning, this he does by making it mandatory for them to borrow whatever they do not have for their learning to be the same with those who have resources like calculators.

ii. There is no mathematics help outside school

In Mr Mathonsi's experience with teaching mathematics to learners in a rural high school reveals that most learners home situation is such that once they get home there is little or no assistance with their mathematics work. This sentiment is pronounced in his narration of learners' plight with the subject outside the school premises, his comment that '*there is no one who can assist*' (line 1039) with mathematics at home echoes learners struggle beyond school premises (table 2, p. 72). However, to address this challenge, he reminds his learners often that they must

do their schoolwork at school during study sessions before they leave for home. To remind learners he recites his commonly issued advice; '*if you know that there is no one to assist at home...remain at school*' (line 1049; table 2, p. 74). So, the study sessions in the mornings and afternoons are aimed at precisely addressing this challenge. However, Mr Mathonsi acknowledges that not all learners he teaches have this problem, as some are able to get help from their parents, although the number of learners who receive help at home is not substantial, hence the stressing of learners to remain behind beyond school hours.

4.3.2.2. *Mathematics Resources*

Extract:

As a strategy, before the maths period, for example, you tell all your learners that before the maths period they must all go out to borrow a calculator, this you do to develop their sense of responsibility even for those who are poor, you want to develop their calculator usage skills, an ability to use resources, so we usually do that (line 894-897).

i. Mathematics resource shortage

The situation Mr Mathonsi finds himself in with his learners is one where some of his learners would come into class without a calculator. This is owing to their impoverished home situation, and in some instances where parents do have the money to buy the calculator, they may not be able to do so immediately. In such instances, he finds a learner when required to take out a calculator that he or she '*does not have one*' (line 884; table 2, p. 72). He regrets how some of his learners are unable to work with calculators late at high school. This goes against his wishes of learners being able to work with a calculator as early as the eighth grade, as he cites that as early as possible in high school, '*a learner must know how to punch a calculator*' (line 881). The criticality of learners being able to work with a calculator is highlighted by Mr Mathonsi's assertion that some operations require a calculator to perform, like certain square root operations.

ii. Coping with resource shortage

He requires his learners to make sure that they come to class with a calculator in order for them to be able to learn mathematics, and for those that do not have it they

must *'borrow a calculator'* (line 895) for them to all learn the same way. This he does to also teach them a sense of responsibility for their own learning. Moreover, Mr Mathonsi expresses appreciation for the support received through sponsorship by a private company. The use of the word *'luckily'* (line 898) when talking about the sponsorship his school receives is indicative of the dire situation he would be finding himself in had the sponsorship not covered some of the most basic resources for learning, like *'calculators and pens, exercise books'* (line 899 – 900). Mention of sponsorship benefits to mathematics teaching and learning is limited only to the most basic, which they too are a benefit that is received *'at times'* (line 899), exercise books and pens (table 1, p. 72). No mention is made to other form of support, this is an indication of how resourceful this (minimal) help is to his learners.

4.3.2.3. *Teaching mathematics*

Extract:

I will use this topic found in grade 12 called Euclidean geometry, sometimes in Euclidean geometry you will find when dealing with congruency and similarly in triangles you must start teaching from grade 10 content, but if they still do not understand, you must then go back to recapping grade 8 content, then gradually I finish it with grade 9 content, I get to grade 10, I get to grade 11, then I teach grade 12 (line 936-940).

i. Awareness of learner's situation

Mr Mathonsi in narrating his experience with his learners in a rural high school, coming from a rural community, explains of how he *'changed'* (line 833) his strategy when he teaches learners after being aware of some of their challenging home background situations. His strategy in teaching learners within the rural context required him to design tasks that would accommodate all his learners and allow him to *'give special attention'* (line 838) to learners who are demoralized for them to realize their full learning potential (table 2, p. 73). Adjusting his teaching strategy, he cites calculator usage skills as central to their mathematical learning development, despite some not having calculators of their own. He emphasizes that when he *'better understand[s] a learner'* 834 and their situation, he will make sure that that learner is not treated harshly when they are lacking or arrives late for class in the morning.

ii. Insufficient Prior knowledge

In the experience of Mr Mathonsi with teaching mathematics to learners in a rural high school, he has become accustomed to beginning every topic by reteaching

content taught in the previous grades. His teaching of content from previous grades is a response to learning deficiencies noted from his learners, leaving him *'forced to teach'* (line 942) content as far back as grade eight in grade 12. His use of the word 'forced' to narrate his experience indicates that he has no other option but to go back before teaching grade relevant content. Mr Mathonsi's experience is of learners who need reteaching every time he introduces a topic at a relevant grade, he always goes *'back to recapping'* (line 942) to bring his learners at a level where they are ready to learn new content (table 2, p. 73 – 74).

iii. Mathematics teaching strategy

Teaching mathematics to learners requires that they be taught thoroughly and be shown *'different methods'* (line 943) of engaging with mathematics and finding solutions to problems. Mr Mathonsi's teaching experience enables him to value the importance of exposing learners to different approaches to learning and be able to graduate from *'unknown to know'* (line 948). This process requires that his classroom engagements with mathematics be open and encourage questioning as a means of strengthening mathematical talk during his teaching and learning for his learners. He places a great deal of importance to allocating time for questioning, in pursuit of *'clearer explanation'* (line 945) his learners are given a *'platform to ask'* questions at the end of the lesson (table 2, p. 74). Explanation is used to respond and simplify questions asked during classroom engagements.

iv. Teaching learners to work collaboratively

In sharing his experiences about his learners learning mathematics in the classroom, he passionately explains how they *'cannot work alone'* (line 932) when they are solving mathematical problems in class. His preferred setup arrangement in a mathematics class is where his learners *'do in groups'* (line 956). This apparent favour of collaborative learning for his learners takes place with an individual learner actively involved within a collective engaging in mathematical activities. He pairs and groups his learners according to their strengths, appreciating that learners possess varying *'levels of cognitive abilities'* (line 1173) therefore the *'brightest learners'* (line 1180) help their peers (table 2, p. 75). His learners that are academically stronger help those that need help during class by explaining to them the concepts, terms and different solution steps to follow when solving a problem.

v. *Teaching and learning time*

In teaching mathematics, Mr Mathonsi cites morning and afternoon study sessions as a necessity for his learners to have the time, space and assistance they require for doing their mathematics practice or homework. His learners '*remain at school*' (line 1049) in the afternoon, and also arrive earlier in the morning before the commencement of the first period to do mathematics during the morning time reserved for the study. The time allocated for teaching on the Annual Teaching Plan (ATP) is not enough when teaching learners at his rural high school, leaving him with an option of scheduling '*extra-classes on weekends*' (line 1107). During this time, Mr Mathonsi emphasises that his learners need him to '*stick to the point*' (line 1162). During revision sessions to equip them with the mathematical skills needed for solving problems during an examination, he stresses how much it helps his learners for them to '*do revision*' (line 1103) before writing an examination or any form of assessment after learning (table 2, p. 74). His arrangement for extra-classes indicate that the time allocated for teaching during school hours is not sufficient for teaching learners in a rural high school.

vi. *Maths assessments are not set in isiZulu*

Teaching mathematics, in Mr Mathonsi's experience, requires him to focus on the mathematical language, '*not English... but mathematical language*' (line 978) he emphasized. His emphasis on mathematical language is noted on his downplaying of the role played by both English and isiZulu language in learning mathematics. In sharing his story on the role language plays in his mathematics classroom, he shifts attention to the end goal of teaching for '*assessments*' (line 979) and explains that mathematics tests and *examinations are 'not set in isiZulu'* (line 976) thus the need for him to focus on the mathematics. In presenting his experiential accounts, he makes a point that there is a difference between mathematical language and English language, this distinction is found in terms and concepts used when describing an operation. So, he tells of how he '*stress the importance of... maths terms*' (line 1011-1012) as they are central to learning mathematics (table 2, p. 75). This mathematical language, he argues, help prepare his learners for assessments.

4.3.2.4. *Motivation*

Extract:

It sometimes happens that a learner leaves for home and find that there is no one to who can assist them, maybe for people who did maths... this you know, there are not many people who did maths, even those who have finished school would say 'I did not know mathematics I did mathematical literacy' (line 1039-1042)

i. Lack of learner motivation

Low morale of Mr Mathonsi's learners is reported to be as a result of the situation they find themselves in at home. This lack of productivity, according to Mr Mathonsi, is owing to their background lacking in motivation, which ends up affecting their morale and energy as he finds some are '*lazy*' (line 851) and this results in them '*performing so dismal*' (line 851; table 1, p. 76). He equates his learners' shortcomings in mathematics learning in the classroom to factors beyond the school premises.

ii. Devotion of teacher

In working with learners in his mathematics classroom, Mr Mathonsi places his understanding and knowing his learners as an integral part of his teaching strategy. While understanding his learners is important, it is not aimed at exempting them from any responsibility. To do this, he says '*we are strict*' (line 1062) making reference to '*we*' suggests a collective effort or culture they have adopted as a school in dealing with their learners as they '*develop their sense of responsibility*' (line 895). As an indication of a consistent effort to train learners to be responsible for their learning, he explains how he '*always strives*' to teach discipline and responsibility, as he suggested that even those without calculators are expected to borrow them before coming to class. This devotion to learners by Mr Mathonsi has seen him produce talented learners whose competency and knowledge he credits as being at a teacher's level, telling of how he sometimes finds a '*learner possessing more knowledge*' (line 1165) than him as a teacher (table 2, p. 76). This he humbly confesses that he is not always very good with all sections, and sometimes '*learners themselves amaze us*' (line 1164) on their mastery skills of some sections.

Structural Description (Sd): Mr Mathonsi

Sd.4.3.2.1. Learner Background

i) Teaching mathematics to poverty stricken and orphaned learners

The context giving rise to the situation described by Mr Mathonsi in relation to his learners' lack of performance in mathematics are some of the adult responsibilities that they have outside school. Mathematics being a subject that requires practice that goes beyond the daily teaching time allocated during school hours. His learners' inability to display mastery of the subject is compounded by their having to split their focus into their studying of mathematics and being heads of their households. It is apparent in Mr Mathonsi's experiential accounts that such an awareness of his learners' situation beyond school is important for his response in assisting them manage their responsibilities. Additionally, such an understanding allows for him to come up with other strategies to cover their mathematics classroom learning needs, this he does because of their impoverished situation.

ii) There is no Mathematics help outside school

The high school where Mr Mathonsi teaches mathematics begins its operations early in the morning for mathematics learners. His operating hours begin the day an hour earlier in the morning, and also an hour is added for mathematics learners daily in the afternoon after school. Teaching mathematics to learners from unfavourable home conditions, Mr Mathonsi explained, requires that space and time be created for learners to do their schoolwork before they leave for home. In general, mathematics is considered as a challenging subject, and in the rural community the school is servicing, not many people know mathematics to be able to assist learners once they leave for home. However, much of the emphasis is placed on the plight of his learners when they get home as a major factor affecting their performance.

Sd.4.3.2.2. Mathematics resources

i) Mathematics resource shortage

The learners in Mr Mathonsi's mathematics classroom come from disadvantaged backgrounds, with some being the ones taking care of their siblings. His knowledge of the background of his learners allows him to devise strategies to enable them to have the most basic tools such as a calculator for doing mathematics

in class, to improve their learning experience and performance. Faced with the problem of resources, Mr Mathonsi teaches his learners without calculators to borrow from other grades so that they can learn to work with in class. During the lesson observation, almost all learners were working with calculators in the mathematics classroom.

ii) Coping with resource shortage

As he facilitated the lesson, he would request all to punch on their calculators and indicate if answer was different from the one written on the board. While there were no other mathematics learning resources either than a calculator, the facilitation of the lesson was such that all learners were engaged in their work given from a textbook exercise. This confirmed how he explained that he addresses the resource challenge by teaching them to be responsible by borrowing a calculator before they come to class. At the school gate there is a sponsor poster enacted, and when I saw that learners had pens, rulers, exercise books and textbooks as the worked on the given task, I was reminded of his reference to sponsorship support as being a luck.

Sd.4.3.2.3. Teaching mathematics

i) Awareness of a learner's situation

The impoverished background that some of Mr Mathonsi's learners find themselves in led to him being sensitive when dealing with his learners. This awareness of their situation places him in a better position to plan his instruction when teaching in a mathematics classroom. The knowledge that his learners are already experiencing hardship at home helps develop his understanding for learning challenges some of his learners have. This has assisted him to shape his responses in the best interest of that learner.

ii) Mathematics teaching strategy

Mr Mathonsi's teaching of different strategies was observed as he was teaching his learners measurement. He broke down how all the formulas were constituted by drawing of net diagrams on the chalkboard and using a chalkbox to demonstrate the three-dimensional shape. His demonstrations also used a cylindrical dirt bin (Appendix B: Observation Schedul, Mr Mathonsi) at the corner of the classroom to show how the dimensions related to each other, and how the circumference becomes the new

length, with the height becoming the breadth when finding the total surface area of a cylinder. He removes the lid to demonstrate an open cylinder, while also editing the formula for total surface area to exclude one of the two areas of circle added to the rectangular part; from $TSA = 2\pi r^2 + 2r\pi h$ for a closed cylinder to $TSA = \pi r^2 + 2r\pi h$ for an open cylinder. After writing the example, which he carefully explained step-by-step, he went on to provide a give an exercise problem for learners to do. When he asks if learners had any questions, he did so in isiZulu, in which learners questioning was done in isiZulu, with a preservation of concepts and terms in a mathematical language. During his teaching, he stressed the important aspects for exam purposes.

iii) *Teaching learners to work collaboratively*

During the lesson observation, Mr Mathonsi's learners were seated in an exam setup, with two learners seated in their double desks, all facing the chalkboard. When learners were working with exercises given to them in class, they communicated with each other in pairs, with some engaging with other learners not seated directly close to them. Mr Mathonsi encouraged that they should check their answers with their peers, if it differed, they should discuss who is right and who is wrong. Although the classroom setup did not resemble *the 'groups' (line 956)* that Mr Mathonsi spoke about during the interview, it was his openly encouraging them to share ideas and how they spoke to each other when they were working on their solutions that showed collaborated learning among learners despite the setup. Learners appeared to know each other's strengths in the mathematics class, this was observed on how most engagements and confirmation of answers revolved around two learners.

iv) *Teaching and learning time*

As a mathematics teacher in a rural high school, Mr Mathonsi places himself at the centre of his mathematics performance, as with all learners need a teacher who is competent, to stress the importance of this, he says as a teacher you must *'know your story' (line 1162)* to be able to train learners for to be successful in their study. Knowing your story in his context requires that a teacher teaching at FET phase (grade 10 to 12) know how to teach the basics taught as far back as grade eight, because learners at grade 11 and 12 lack the requisite prior knowledge which form the base of those grade's syllabus. Reteaching previous grades skills end up using up too much time

that he would not be able to recover without planning extra mathematics classes on weekends, over and above morning and afternoon study sessions.

The home situation of his learners is such that some cannot perform extra mathematics exercises and questions outside school. To address this learners' challenge, there is a study in the morning and in the afternoon for learners to do their schoolwork either before school commences in the morning, or before leaving for home. Every learner knows what is expected of them, therefore the study sessions ensure that all work given for extra practice outside the normal teaching time, they have done it '*assisted by others at school*' (line 1056). This addresses the problem of learners getting stuck with maths work alone at home, or being inundated with home chores and responsibilities that would lead to them not being able to do their maths practice problems or assessments.

These extra classes serve a twin purpose in the context Mr Mathonsi teaches in; the first being the recovery of time lost to teaching prior knowledge and base skills teaching, and the second is affording his learners with extra support and space for learning that they do not get outside school.

v) *Maths assessments are not set in isiZulu*

To understand Mr Mathonsi's mathematics teaching experiences it is essential to explain the context of teaching in a rural high school. Although all his learners are isiZulu home language speakers from the rural community he services, the official language of teaching and learning at the school is English, with isiZulu only done as the home language subject. This means that all the subjects at the school are assessed in English, except for isiZulu language as a subject at his school. However, he explains that mathematics is neither done in isiZulu nor in English as it has a language of its own. This understanding has led to Mr Mathonsi focusing on the mathematics when he teaches his learners. This focus means that his teaching during class is done using both isiZulu and English as modes of transporting mathematics learning, which has its own language. Mathematical language in his class is used for his learners to respond better during mathematics assessments.

During the lesson observation, learners in his class frequently used isiZulu language to communicate mathematical operations. This confirmed his response during the interview session on his teaching of mathematics terms and the importance of his

learners knowing these mathematics operations using the appropriate language, mathematical language.

Sd.4.3.2.4. Motivation

i) Lack of learner motivation

The background of many of the learners in Mr Mathonsi's mathematics classroom is not favourable to support their success in school. Some of his learners being the only ones left in their families to look after their siblings makes them less motivated to focus on their schoolwork. To address this problem, Mr Mathonsi comes closer to such learners who he identifies as having a problem to devise a solution for such learners. The surrounding factors end up affecting learners' level of commitment in his mathematics classroom. The lack of motivation he sees in some of his learners all emerge from their home situation.

ii) Devotion of teacher

Teaching mathematics in a school marred with contextual challenges as narrated by Mr Mathonsi as he shares his experiences, requires that he teach his learners to be responsible with their time and commit to their own learning despite their circumstances. The commitment to his learners is such that he knows all those with pressing home challenges and makes it a point that he teaches them to be responsible and guides them closely without treating them like they have no challenges. The fact that all learners had calculators during the measurement lesson when visiting his class for an observation is an indication of how their strictness and commitment to learners' learning works in the classroom. Regardless of the challenges learners encounter, it is the teacher's commitment to their development that matters. This has created learners whose mastery of mathematics is at an exceptional level despite their home situation.

Long-Paragraph on Mr Mathonsi's Experience

The experiences of Mr Mathonsi with teaching mathematics to learners from a rural area present a situation of his learners as marred with deprivation and adult responsibilities. Some of his learners' poor home background and being orphaned mean they have no support for basic resources such as calculators for their mathematics learning. This reality he sees in his learners' lack of motivation in the

subject and their laziness in doing their schoolwork. It is when he makes further probe on the reason for this so that he can help them within the school with the support structure they need for learning. The support he gives ranges from counselling them privately and extending the learning space time at school to help those learners whose home situation does not allow them to study effectively. In Mr Mathonsi's teaching experience, it is crucial for him to know and understand the challenges befalling his learners for him to make effective intervention to assist them. This awareness is important because of the context he teaches in. It is not only contextual awareness that Mr Mathonsi seeks to probe and understand, but also in his teaching he stresses the importance of assessment and diagnosing learners' shortfalls, which are mostly their poorly developed base-line knowledge, otherwise known as prior knowledge. In his teaching, he allows learners to focus on the mathematics and not language as he aims to teach them in a way that makes them to pass assessments, which are not written in isiZulu, neither are they dependent on the learners' English understanding, but on the language of mathematics, which he stresses must be taught thoroughly by a teacher who knows their story.

Table 3: Themes emerging from interview with Mr Legend

Descriptive/frequently used	Linguistic/key words	Conceptual comment	Emergent themes	Superordinate themes
They were taught in isiZulu Love Comfortable	<i>They were taught using isiZulu 488</i> <i>comfortable with isiZulu 562</i> <i>they love isiZulu 589</i> <i>it makes them fall in love with the subject 590</i>	His learners are used to being taught in isiZulu, this begins in their primary schooling. Learners engage freely in their mother tongue Language barrier removed, isiZulu makes them focus on the mathematics Language as motivation, so that they relate with the subject	IsiZulu for learning	Teacher's experience of learner background
Limited resources No calculator Go and borrow calculator	<i>Lack of resources negatively affects them 610</i> <i>Cannot learn mathematics without a calculator 614</i> <i>Whoever does not have a calculator must go and borrow 617</i> <i>Value of sine 20°</i> <i>Borrow from another grade 620</i>	Resource shortage hampers effective teaching and learning of mathematics Seeks his own classroom solutions to mathematics learning resources, Learners without calculators are required to borrow from other grades or classes Learners' impoverished background places teacher in a difficult position as learners request for calculators at home places parents in additional financial stress.	Lack of resources Coping with resource shortage	Resources

Poverty	<i>Poor background 612</i>			
The learner is hungry	<i>learner...is hungry 523</i>	He feels for his learners' impoverished background, here, experience of his learners' background is expressed in how they go hungry.	Rurality context/Teaching Impoverished learners	Rurality Context/ Background
Poverty	<i>lot of poverty 523</i>	Talks of psychological damage poverty has on his learners,		
Psychological effect poverty brings	<i>poverty has really affected them 533</i>	Is appreciative of efforts made by government through school nutrition program, but laments its limit to school, care expressed for learner outside school.		
Limited nutrition program support	<i>feeding scheme</i>	His learners have no support outside of school. Any other potential help outside the school is from someone far from where his learners stay. (sparsely populated, neighbours are far apart, common rural areas settlement pattern)		
Motivation	<i>motivation becomes necessary 530</i>			
Encouragement		Encouragement and motivation does work		
Do work	<i>they do work 552</i>			
His learners background as a source of discouragement	<i>Mentality...maths is difficult 492</i>	Difficulty of teaching learners from poor backgrounds His engagements with his learners unveils the roots of their demoralised attitude towards school, and in particular mathematics.	Lack of motivation	Learners Motivation
Fixing learners mindset	<i>Attitude...towards mathematics not right 494</i>	He finds his learners have been instilled with a negative mentality, probably back	Learner attitude	Learners Motivation

<p>Motivation</p> <p>They are sensitive</p>	<p><i>Needed to start by fixing... mindset 495</i></p> <p><i>Expose our learners to the various opportunities 505</i></p> <p><i>They begin to how love for mathematics 506</i></p> <p><i>They even hold extra classes without a teacher 710</i></p> <p><i>talk nicely... encouraging them 552</i></p> <p><i>They organise themselves into a group and work 711</i></p> <p><i>To avoid the problem of not getting assistance once they reach home 712</i></p>	<p>when they were still in primary school. This he takes upon himself to remove this thinking while teaching maths.</p> <p>His learners' lack of motivation stems from their lack understanding what mathematics is for. This hurdle he overcomes by teaching his learners about the mathematics and its potential to unlock opportunities.</p> <p>Respect for his learners is shown by his knowledge that they too are human and although they may not be motivated, but they do not take kindly to being called failures</p> <p>Learners use collaborative learning to assist each other at school</p> <p>His learners only receive maths help at school. There is no one at home with the skills</p>	<p>They organise themselves for extra classes</p>	
<p>Respectful and co-operative learners</p> <p>Negative mentality</p>	<p><i>They are very respectful and cooperative 547</i></p> <p><i>see themselves as a possible solution</i></p>	<p>Appreciates values instilled at his learners' home, as they make them respectful learners</p> <p>He turns his learner's stories of their backgrounds to motivation for them to not loose hope. Telling them they could be agents of change in their homes.</p>	<p>Rurality context /Respectful/Disciplined learners</p> <p>Attitude/background</p>	<p>Attitude towards maths/Motivation</p>

Switching to isiZulu led to some understanding	<i>IsiZulu is for communication 585</i>	His use of English to teach mathematics was not compatible with his learners. However, a switch to isiZulu led to better understanding for his learners	IsiZulu and mathematics	Teaching Mathematics
They are comfortable with isiZulu	<i>only challenge would be concepts 566</i>	He wishes isiZulu was fully 'endorsed' as the medium of instruction, but concedes that mathematical terms would still be the same as translating them to isiZulu was not, in his view, possible.		
Mathematics register	<i>Mathematics has its own specific mathematical terms 584</i>	He uses isiZulu to gain better participation, as learners think using their home language, and therefore, he uses the language to bring maths 'closer' to his learners' life realities. They relate better in isiZulu		
Linguistically and context relevant examples for maths lesson	<i>there many concepts in mathematics that might pose a challenge expressing in isiZulu 568</i>	Uses both isiZulu and English during his maths lessons.		
It would be difficult translating mathematical terms to isiZulu	<i>[mathematical terms] that will not be translated in isiZulu 568</i>	Through his use of isiZulu to teach mathematics, some learners achieve distinction pass for the subject. This may indicate the support achieved by using isiZulu to teach mathematics		
	<i>Does not understand when you are using English 594-595</i>	His experience of using isiZulu when teaching his learners is positive. It is how his learners relate to what he teaches that lead to successes of his learners. For this	IsiZulu for maths	
	<i>closely relate to environment if it is in isiZulu 564</i>			

	<i>They excel...isiZulu helps them</i>	he credits isiZulu for coming to the rescue of his learners.		
Teacher is the only source of maths learning	<i>Does not understand when you are using English 594-595</i>	He narrates how his learners depend on him for learning maths as there is no one who can help at home.	Mathematics teaching	Experience of Teaching Mathematics
No help at home	<i>They excel...isiZulu helps them only challenge would be concepts 566</i>	His learners discipline is viewed in their active engagement even without the supervision of the teacher. They collaborate, learner centred and driven. He comes to their aid for scaffolding and monitoring.	Teaching maths at school - all learners' needs	
	<i>Does not understand when you are using English 594 595</i>	His knowledge of rural life places him in a position to teach using learners' environment-based examples		
	<i>They are able to borrow each other... to continue learning 618 619</i>	Maths has its own terms, which do not change even when teaching with isiZulu. (IsiZulu for communicating maths language)		
Some hide behind others	<i>Give them examples...relevant to their environment 587</i>	Some maths operations cannot be done without a calculator, for example, the value of sine 20 cannot be done mentally or without using a calculator. So, his awareness of his learners' impoverished background led him to devise a strategy of allowing his learners	Discipline	
	<i>We do not keep trailing behind...work that must be covered 660 661</i>		Learner centred approach	
			Mathematical language	

They work collaboratively	<i>Do corrections before beginning each day's lesson 672</i>	to borrow calculators from other classes before his maths period commences.		
Prior knowledge	<i>Cannot begin teaching new work without addressing the work done previously 674</i> <i>Mathematics has links 674</i> <i>Not possible to do one-on-one because of overcrowding 695</i> <i>End up not teaching on that period 697</i>	Overcrowding leads to some learners not getting attention as they hide behind other to avoid participation He sees the value of giving special attention to each and every learner in class through the lens of a learner who will feel special and whose progress is in the teacher's interest.	Collaborative learning	
Realistic maths with Home language	<i>Group together those learners with common challenges 697</i>	Grouping of learners with similar challenges to teach maths separately, give special attention during extra classes. His learners work collaboratively assisting each other, he makes it a point that he is also with them to assist when they get stuck.	Overcrowding	
Maths concepts and terms	<i>Some avoid your attention 701</i> <i>Learners also help each other 705</i>	This is done to create a learning space with support for those who need help and cannot get it back home. This creates some time at school to do their daily homework. He does extra classes for his struggling learners, this speaks to the shortage of time, or the nature of teaching bound to have learners needing special attention, or	Collaborative learning	

<p>Borrow calculator from another class</p> <p>Extra classes</p> <p>Occupy during free periods</p> <p>Cover the syllabus (make more time)</p> <p>They help each other</p> <p>Create extra classes to cover the syllabus</p> <p>Solid basics</p> <p>Teach technique</p>	<p><i>They work collaboratively 707</i></p> <p><i>I monitor them 705</i></p> <p><i>Talking about their own stories 707</i></p> <p><i>Only receiving help here at school 640</i></p> <p><i>I try doing extra classes 653</i></p> <p><i>Whether they learn maths in isiZulu, or in English... maths is all about the technique 732-733</i></p>	<p>create space for learners with no support at home to have study time at school with the aid of a maths teacher. To address learner background challenges. Also, during free periods, attending to them for extra help, practice time allocation.</p> <p>He does remedial work, takes care not to complete the syllabus for the sake of completing without his learners achieving the learning outcomes for maths.</p> <p>He ends up creating time to address all the maths learning challenges experienced by his learners.</p> <p>This he does to make sure he attempts to cover the syllabus, although this is not always possible.</p> <p>If a learner has been taught solving techniques properly they will be able to solve any problem.</p>	<p>Extra classes, becoming a tutor (during and after contact time)</p>	
<p>Technique</p>	<p><i>maths is all about the technique 733</i></p>	<p>A learner will always answer the question paper if they have a firm grasp of mathematical processes and techniques.</p> <p>Assessment in his experience is testing grasp of the mathematics, using mathematical symbols a learner should answer with ease if they are prepared.</p>	<p>Assessment</p>	<p>Teaching mathematics</p>

4.3.3. Mathematics teaching experiences: Mr Legend

Textural Description of emerging themes from Mr Legend's experiential accounts. Table 3, pages 88 – 95, makes a presentation of themes emerging from interview data, sourced from transcript in Appendix A.

4.3.3.1. *Teacher's experience of learners' background*

Extract:

you find that even in primary school, since I am in a high school, even in primary school if you ask learners they would tell you that most of the time they were taught using isiZulu. In instances where as a teacher you teach using English, you could see that they were getting left behind, they do not understand, but immediately when switched to mostly include isiZulu, some would begin to show they are understanding (line 486-491)

i. IsiZulu language experience

Mr Legend observed in his teaching that when he mostly used English to facilitate the mathematics lesson his learners did not participate. However, when he switched to use isiZulu to communicate during the lesson, learners appeared to respond better to learning instruction. This, according to Mr Legend was because his learners '*were taught using isiZulu*' (line 488) from their primary schooling, which made them feel more '*comfortable with isiZulu*' (line 589) during classroom learning. His learners are used to being taught in isiZulu, this begins in the lower grades in primary school. In Mr Legend's experiential accounts, he explained how his learners' level of engagement improves in the classroom when they are allowed to freely express their ideas in isiZulu (table 3, p. 88). A practice that he attributes to his learner's '*love*' (line 589) for their home language, which subsequently makes them '*fall in love with the subject*' (line 590). It is the freedom that comes with learners' engagement in their mother tongue that allows them to focus on the mathematics, which acts as a motivating factor for learners to view mathematics in a positive light, which they can relate from home.

ii. Rural context background experience

Extract:

...most learners come from households with a lot of poverty, you will find a learner you are teaching is hungry, they can hardly follow on what you are teaching (line 522-524).

The impact poverty has on his learners impacts on his teaching as he sometimes sees how '*hungry*' (line 523) his learners are in class. Mr Legend

bemoans how poor his learners are, and how much *'poverty has really affected them'* (line 533). Much of his pity for his learners is on their home situation, when they get home, because at school there is a nutrition program in the form of *'feeding scheme'* (line 534) which provide for such learners with a single meal a day. An intervention, he laments as insufficient as the learners would still need a meal when they get home, or before they sleep. This could be an indication that some of his learners only receive a meal at school, making their home environment one of *'lot of poverty'* (line 523) and not supportive to their learning (table 3, p. 89). Moreover, a belief held by most learners is that *'maths is difficult'* (line 492) has got to be addressed before any real teaching can take place in a mathematics classroom.

4.3.3.2. Resources

Extract:

We have a shortage of resources, I do not want to lie, lack of resources negatively affects them. I sometimes even say, if you take calculators, and taking into consideration their poor backgrounds and not wanting to put their parents in additional expenses they can not pay, I say atleast a learner must go and borrow from another because they cannot learn mathematics without a calculator. Take trigonometry, if you are required to find the value of $\sin 20$, how do you find this value without using a calculator? (line 610-616)

i. Lack of resources

As Mr Legend shares how lack of resources affects his teaching in mathematics classrooms, he pays particular attention on the importance of calculators in for his learners during mathematics lessons. He cites how his learners are *'lack of resources negatively affects them'* (line 610) as there are some mathematical operations that require a calculator to find. Placing emphasis on his point, he states that learners *'cannot learn mathematics without a calculator'* (line 614) as they progress to deal with sophisticated operations at high school, giving an example of *' $\sin 20^\circ$ '* as one such operation that requires a calculator to find. His empathy for his learners *'poor background'* (line 612) as he puts it, to describe the underlying financial situation experienced by learners' home status (table 3, p. 88). This has resulted in Mr Legend devising strategies to bridge the resource need in class.

ii. Coping with resource shortage

Resource shortage hampers effective teaching and learning in Mr Legend's mathematics classes. The impoverished background of some of his learners has led to Mr Legend coming up with a rule for '*whoever does not have a calculator must go and borrow*' (line 617) before the mathematics lesson commences. This strategy ensures that where calculators are not in use, learners who need them can '*borrow from another grade*' for learning to continue unhampered by lack of a calculator for a learner from a '*poor background*' (line 612). This is aimed at ensuring that all learners have a calculator to use during the lesson, regardless of background. Mr Legend seeks his own classroom solutions to mathematics learning resources shortages.

4.3.3.3. *Motivation*

Extract:

That is when motivation becomes necessary for a learner to see themselves as a possible solution to changing the situation at home, you know, that they can become the solution to changing their home situation that is not good. But poverty has really affected them, even psychologically (line 530-533)

i. Lack of motivation

Mr Legend tells of how his learners have a '*mentality*' (line 492) that was instilled very early on before they came to high school that '*maths is difficult*' (line 492; table 3, p. 89 – 90). This belief he addresses by making his learners see the importance of mathematics as a subject they can learn in order to be agents of change for their home situation and community. He laments at the difficulties of teaching learners from poor backgrounds as demanding that he engage with them to diagnose their situation that prevent them from engaging with the mathematics. He observed how the '*attitude*' (line 494) of his learners '*towards mathematics [is] not right*' (line 494; table 3, p. 90). It is during this diagnosis that he identifies how '*motivation becomes necessary*' (line 530). When he noted how his learners were demoralised with school and mathematics learning in particular, it was obvious that their home situation was part of the reason why they had no zeal to do mathematics. It became apparent that his learners had no mathematics support outside school. And any possible help could not be located close by, a person who could assist was located far away from where they stayed.

ii. Positive motivation

His learners' lack of motivation stems from their lack understanding what is the purpose of learning mathematics. This hurdle he overcomes by teaching his learners about the mathematics and its potential to unlock opportunities. For effective mathematics teaching to take place, Mr Legend '*needed to start by fixing*' (line 495) his learners' '*mindset*' (line 495) first. He turns his learners' stories of their backgrounds to motivation for them to not lose hope. Telling them they could be agents of change in their homes. The fixing of learners' mindset began by making them see the importance of doing mathematics and the opportunities that it would present them with. Mr Legend did this by exposing '*learners to the various opportunities*' (line 505) that can help change their home reality, as well as broader community (table 3, p. 90). Motivating and encouraging learners became important for learners to change their perspective on mathematics, for learners to see themselves as '*the solution to changing their home situation*' (line 531). Mr Legend tells of how '*talking nicely*' and '*encouraging them*' (line 552) leads to better motivated learners who are self driven even when he is not in class, they organise themselves and '*do work*' (line 552).

He appreciates the values instilled onto his learners from home, as they make them respectful and cooperative learners. Respect for his learners is shown by his knowledge that they too are human beings and although they may not be motivated, but they do not take kindly to being called failures. And once they feel that they are being taken seriously and feel that the teacher values their efforts and contributions, they begin taking themselves seriously. Once learners are motivated, '*they begin to show love for mathematics*' (line 506) in ways that benefit their learning and development with the subject. Learners begin to be disciplined to work on their own without the supervision of the teacher, Mr Legend narrates of how his learners '*even hold extra classes without a teacher*' (line 710) assisting each other to learn and practice mathematics. His learners '*organise themselves into a group and work*' (line 711) is an indication of how his learners are responsible once motivated to work (table 3, p. 90). Mr Legend identifies his learners actively organising themselves as a means to address their lack of support with their studies once they reach home, he states that they do so '*to avoid the problem of not getting assistance once they reach home*' (line 712). Learners use collaborative learning to assist each other at school. His learners only receive maths help at school. There is no one at home with the skills.

4.3.3.4. Experience of teaching mathematics to isiZulu home language speakers

Extract:

Mathematics has its own specific mathematical terms that are used, so the use of isiZulu is for communication, say maybe you are not able to give a proper explanation of the mathematical term in isiZulu, you do examples and give them examples using things that will be relevant to their environment, as you can see they are in a rural area, so it is mostly isiZulu that we use for communication although English is also used, it is isiZulu that they enjoy using the most.

i. IsiZulu language and mathematics

The teaching of mathematics to learners who are isiZulu home language speakers takes place in its own mathematical language, and '*isiZulu is for communication*' (line 585). His use of English to teach mathematics was not compatible with his learners. However, a switch to isiZulu led to better understanding for his learners (table 3, p. 91). This communication of mathematical ideas in the classroom, as per Mr Legend's accounts, is possible to communicate in isiZulu because '*mathematics has its own specific mathematical terms*' (line 584) that do not change when communicating in isiZulu '*that will not be translated to isiZulu*' (line 568). Moreover, as Mr Legend makes an expanded narration of his experiential account, he credits the role of isiZulu in allowing his learners to communicate mathematical ideas freely, but lament how translating mathematical terms and concepts to isiZulu might present deeper challenges as they are not readily available in everyday language uses.

He wishes isiZulu was fully 'endorsed' as the medium of instruction, but concedes that mathematical terms would still be the same as translating them to isiZulu was not, in his view, possible. To express this difficulty, he states that the only '*challenge would be concepts*' (line 566) and states that '*there are many concepts in mathematics that might pose a challenge expressing in isiZulu*' (line 568). In Mr Legend's experience, his learners '*do not understand*' (line 594) when English is used to communicate mathematical ideas (table 3, p. 91 – 92), but they can '*closely relate to environment if it is in isiZulu*' (line 564). He uses isiZulu to gain better participation, as learners think using their home language, and therefore, he uses the language to bring maths '*closer*' to his learners' life realities. They relate better in isiZulu. Through his use of isiZulu to teach mathematics, some learners achieve distinction pass for the subject. This may indicate the support achieved by using isiZulu to teach mathematics. His experience

of using isiZulu when teaching his learners is positive. It is how his learners relate to what he teaches that lead to successes of his learners. For this he credits isiZulu for coming to the rescue of his learners. So, he uses both isiZulu and English during his maths lessons.

ii. Teaching and learning time

During contact time, Mr Legend tells of how he begins each mathematics lesson by doing remedial work on exercises given the previous lesson. Underpinning his view of teaching mathematics is expressed in his view of the discipline as having '*links*' (line 674). This view of mathematics is followed through by his account that he '*cannot begin teaching new work without addressing the work done previously*' (line 674) and as he does this, he tells of how his class ends up '*trailing behind*' (line 660) on the curriculum coverage as scheduled in the annual teaching plan ATP. To address this, he ends up scheduling extra-classes outside of notional time, on Saturdays, school holidays, and morning and afternoon classes. This he does in order to do the '*work that must be covered*' (line 660; table 3, p. 93). Time is never enough for teaching and learning under the conditions in which Mr Legend teaches, which requires scheduling for additional time before the school starts in the morning, after school in the afternoon, weekends and during school holidays.

iii. Overcrowded mathematics classrooms

Mr Legend laments overcrowded mathematics classrooms as limiting the amount of attention he is able to give to a single learner at a time. He tells of how he is not able to attend to his learners on a '*one-on-one*' in overcrowded classroom settings, as he teaches against the time, he fears such an attempt would mean he would '*end up not teaching on that period*' (line 697). He regrets how overcrowded classrooms lead to some learners avoiding his '*attention*', when he is unable to attend to all of them (table 3, p. 93). As a strategy, he has sought to '*group together those learners with common challenges*' (line 697) and attending to them separately, utilising the extra class time to bring them up to speed with the rest of the class.

iv. Collaborative learning

Mr Legend's learners work collaboratively assisting each other, he makes it a point that he is also with them to assist when they get stuck. In Mr Legend's

mathematics classroom, '*learners help each other*' (line 705, table 3, p. 94)) even when he is not in class. He observed how his learners form groups on their own, and sometimes after school. This is done to create a learning space with support for those who need help and cannot get it back home. When learners work alone, without his supervision, he would find them sometimes '*talking about their own stories*' (line 707) which is why he '*monitor[s] them*' (line 705) to ensure no time is lost for the needy learner. His learners '*work collaboratively*' (line 707). This creates some time at school to do their daily homework. He sees the value of giving special attention to each and every learner in class through the lens of a learner who will feel special and whose progress is in the teacher's interest.

v. *Extra-classes*

When teaching mathematics in a rural context such as the one Mr Legend finds himself teaching in, '*it is not always possible to cover all work*' (line 669) as required by the annual teaching plan (ATP). This difficulty is caused, in part, by the fact that new mathematical skills to be taught '*links*' (line 675) with work previously learned. This results in the expansion of teaching time as Mr Legend '*addresses the previously done work*' (line 674) because the basics taught in previous grades work are required for '*learning upcoming topics*' (line 675). His focus on prior knowledge reteaching to his learners end up consuming time that is allocated for teaching new grade relevant mathematics sections (table 3, p. 93).

Furthermore, Mr Legend's inability to do '*one-on-one*' (line 695) attention with his learners because of classrooms that are '*overcrowding*' (line 695) requires him to come up with strategies to assist his learners and complete the syllabus in time before formal assessments at the end of the term or year (table 3, p. 93). Highlighting the importance of giving each learner special attention, Mr Legend resorts to planning and teaching morning and afternoon classes, and also calls his learners during weekends and during their school holidays in order to cover work that is required for the syllabus, and also attend to those learners with similar learning needs during the extra classes. His learners have since gotten used to the concept of learning during extra classes, they '*come to school on Saturday*' (line 653; table 3, p. 94) and also '*arrive at 7 in the morning*' (line 657) for mathematics learning. Grouping of learners with similar

challenges to teach maths separately during the extra classes allow him to give special attention and focus on assisting those learners.

vi. Mathematics Assessments

In Mr Legend's experience, if a learner has been taught solving techniques properly they will be able to solve any problem, '*whether they learn maths in isiZulu, or in English*' (line 733). As he explains further, he tells how a learner will always answer the question paper if they have a firm grasp of mathematical processes and techniques. He tells of how '*maths is all about the technique*' (line 733; table 3, p. 95). Assessment, in his experience, is testing the grasp of the mathematics, using mathematical symbols a learner should answer with ease if they are prepared and know the mathematical language.

Structural Description (Sd): Mr Legend

Sd.4.3.3.1. Teacher's experience of learners' background

i) IsiZulu language experience

The learners in Mr Legend's mathematics classroom are coming from the rural community, from areas surrounding the school, and primary schools around the area are attended by learners from the community. The language spoken by learners at his school is isiZulu, their home language and a language through which their primary school learning conducted in. During a mathematics lesson observation of Mr Legend's mathematics lesson on measurement, his learners naturally engaged and made contributions to the lesson through responding to questions asked through their home language, isiZulu. The use of isiZulu by his learners extended to when they were engaging among themselves. However, there were instances where some of his learners used English, with isiZulu, interchangeably to express their mathematical contributions.

Sd. 4.3.3.2. Resources

i) Lack of Resources

The context Mr Legend teaches in requires him to work with what he has at his disposal. The resource shortage during the lesson observation became evident when

only three learners had calculators out of 17 learners present. Learners only had textbooks in front of them as their teacher used chalkboard drawings and a duster to demonstrate dimensions of a box. The prefabricated mobile classroom also had a learner sitting on a desk, this results from learners taking furniture from other classes because of a shortage of furniture at the school. There are no other resources to assist in teaching of mathematics, Mr Legend cited theft as another challenge plaguing the school as some computers which were donated were all stolen. He regrets the state of resource shortage as robbing his learners of a better learning experience, which he suggests computers would be assisting in improving his learners learning experience on a follow-up interview.

ii) Coping with resource shortage

The resource situation in Mr Legend's mathematics classroom confirms his experiential accounts on the shortages of calculators. During the lesson observation, only four out of 17 of his learners had calculators. While teaching measurements, he requested for confirmation of an answer shouted by one learner, asking another if the value found was a correct one according to their calculation. When I engaged with Mr Legend after the lesson on the shortage of calculators, he indicated that sometimes during the first lesson learners would not have had time to go and borrow calculators from other grades. This leaves him forced to proceed with the lesson while those without calculators worked on the solutions of those with calculators in class.

It was further noted during the lesson observation on measurement that most of his demonstrations used things like a chalkboard duster to show how the dimensions of the shape were linked, and all other shapes were drawn on the chalkboard. No posters, or any other mathematics resources were observed, despite the classroom where mathematics learning took place being newly assembled (prefabricated classroom), all mathematics classrooms lacked any form of resources for teaching and learning mathematics.

Sd. 4.3.3.3. Motivation

i) Lack of motivation

The lack of motivation from his learners could be seen in how some arrives 20 minutes late for the mathematics class in the morning. Also, his learners not making

an effort prior to borrow calculators as he indicated he had instructed them to do so before a mathematics lesson. It could also be noted during the lesson observation that only three learners were actively participating in the mathematics lesson, the reason for this could have been the fact that others did not have calculators with them during the lesson.

ii) Positive motivation

Learners working in pairs and in groups of three in class indicated that there was some motivation to learn despite the poor situation some find themselves in. It is common for learners within attending at Mr Legend's school to attend morning and afternoon classes, and to be seen going to school during weekends. Learners who do mathematics assist each other with mathematics, with or without the teacher's supervision. Mathematics as a subject is often done by a handful of people, and is widely accepted as being challenging. This trend is no different in rural areas, and it would follow that not many people would have the mastery of the subject solidly grounded enough to assist learners within the community outside of school.

Sd. 4.3.3.4. Experience of teaching mathematics to isiZulu home language speakers

i) IsiZulu language and Mathematics

Mr Legend in his teaching of mathematics to his learners uses isiZulu with mathematical terms. Observing his learners engage among themselves in class, they also communicate using isiZulu, and their mathematical contributions in class preserve mathematical terms as they are expressed and taught by the teacher. The school uses English as a medium of teaching and learning, as all formal assessments are done in English. However, the home language at the school is isiZulu, and all learners learn English as a second language. Hence the prevalence of isiZulu for communication, which is limited by teaching and learning materials, and assessments in its inability to extend to the mathematics terms. The language used by the teacher and his learners frequently is isiZulu, moreover, the language is also used to simplify and explain complex mathematics operations, limited to the depth it offers in making those explanations. For example, during the lesson observation, when a teacher presented a mathematical concept, they would do so in isiZulu, but all mathematics terms would be preserved as they appear in the textbook. The use of isiZulu is a natural occurrence in a context such as the one Mr Legend teaches in, where he is limited by lack of

isiZulu vocabulary in making explanations, he resorts to using different examples and demonstrations.

ii) Overcrowded mathematics classrooms

Teaching mathematics to learners with the contextual challenges highlighted by Mr Legend requires that he builds his lesson from a solid foundation, by providing a service to all his learners. To make sure that his learners have the requisite basic skills, it is important for him to teach new mathematical skills, relevant to the grade he teaches. During the lesson observation, it would not have been possible for him to introduce or even teach total surface area without learners first understanding standard formulae for area of shapes. This means that his lesson is dependent on the knowledge acquisition and skills set learned and remembered by his learners from previous grades. Mr Legend going back and forth is bound to consume his valuable teaching time, which he is required to teach grade relevant content within the given timeframes. He ends up forced to create additional time to cover the syllabus as required by the ATP.

Teaching mathematics in a classroom that is overcrowded certainly presents a teacher with a challenge of giving learners special attention. However, on visiting Mr Legend's grade 11 mathematics class for a lesson on measurements, I observed the contrary. The number of learners in his observed classroom was 17, with sparsely arranged furniture indicating that the number was capped at that low for that class. Upon further engagement with Mr Legend on this relatively low number of learners against his earlier made statement that his teaching was affected by overcrowding, he explained that the class I had visited had been split into two because of the regulations from coronavirus. He alluded to the fact that even the classroom they were learning in was one of three that were brought to the school as part of the intervention to reduce learner numbers during covid-19, aimed at curbing the spread of the virus. The reduction in learner numbers, according to Mr Legend, helped afford learners with better learning of mathematics as he could now attend to them individually during the lesson.

iii) Collaborative learning

The common home language isiZulu shared by Mr Legend's learners make communication among themselves a natural thing during mathematics learning as well

as in normal conversations. Learners coming from the same community means they have a lot in common, including their experiences. The friendship and commonalities among learners require that the teacher monitor their studying during their extra classes as they are likely to engage on their own stories and not practice mathematics.

iv) *Extra-classes*

He does extra classes for his struggling learners, this speaks to the shortage of time, or the nature of teaching bound to have learners needing special attention. Moreover, these classes create space for learners with no support at home to have study time at school with the aid of a maths teacher. To address learner background challenges. Also, during free periods, attending to them for extra help, practice time allocation. He does remedial work and takes care not to complete the syllabus for the sake of completing without his learners achieving the requisite understanding of the mathematics he teaches. He ends up creating time to address all the maths learning challenges experienced by his learners. This he does to make sure he attempts to cover the syllabus, although this is not always possible.

The context in which Mr Legend teaches in demands of him to find additional time to teach so that the syllabus is covered in time. The need to focus on basics and reteaching sections done in previous grades, needed to lay the foundation necessary for teaching grade relevant content creates a demand for time, which he supplements by arranging additional teaching time outside the normal school time. The overcrowded classrooms Mr Legend finds himself teaching were reduced by the interventions brought by the department of education in response to the coronavirus regulations which required classroom capacity to be capped at 50%. The lower numbers observed in his grade 11 mathematics classroom resulted from such an intervention which saw the school receiving additional classrooms.

v) *Mathematics Assessments*

During Mr Legend's lesson observation, it was evident that his teaching is designed to prepare learners for assessments. Preparing his learners for assessments could be noted in his reference to how the question will be phrased and how learners were taught to remember the formula for either volume or total surface area, paying

particular attention to dimensions, how to use a calculator and using the correct units (cm^2 or m^3)

Long-Paragraph on Mr Legend's experience

The experiential accounts of Mr Legend on teaching mathematics to isiZulu home language learners in a rural high school provide for an insight into how much he understands his learners' learning requirements. In his narration, Mr Legend shares the strategies he adopts to respond to his learners' situation, he does this to teach mathematics for understanding through drawing his experience. He begins by passionately explaining the fondness of isiZulu language by his learners when communicating among themselves and during mathematics learning in class. The fact that the school he teaches is located in a rural area of Ndwedwe, within the province of KwaZulu Natal, makes isiZulu the main language of communication despite English being the school's official language of teaching and learning. Mr Legend uses both isiZulu and English to teach, however, when using isiZulu language to explain concepts to his learners, the mathematics terms are used as they appear in the textbook. He finds isiZulu helps create an atmosphere where his learners can engage freely in classroom discussions and ask questions. Learners in his class were communicating mathematical procedures in isiZulu, with terms like length, breadth, height, radius, formula, brackets, and all other mathematical processes are referred to as they would appear on textbooks and assessment tasks. Besides the fact that Mr Legend credits isiZulu language for assisting his learners learn better, his teaching of mathematics using mathematical language is because there are no isiZulu mathematical terms in use, according to him, and he states it would be a challenge translating these terms to isiZulu. In teaching his learners in this way, Mr Legend states that it helps them as some excel. For those who are struggling during assessments, he argues, that it is not because of language but lack of grasping the mathematical technique required for them to do well in the subject.

The teaching experience of Mr Legend in a rural high school to learners from a low economic class and lack of home support presents him with challenges of learners who are unable to do mathematics work at home. This challenge, coupled with the lack of prior knowledge by his learners and the general lack of resources and calculators, which results in the teaching time being inadequate for covering the syllabus in time. As a response to such challenges, he does extra classes, which his

learners have become accustomed to as they would at times organise themselves into groups and learn without his supervision. This they do to avoid the problem of not getting maths practice time or help once they leave school.

4.4. Data Analysis

4.4.1 Teachers experience of learners' language preference

Mr Legend and Mr Nothile share the learning experience of their learners as having been taught in isiZulu from primary school up to high school. A study by du Plessis and Mestry (2019) also observed how English is viewed as a foreign language by learners in rural schools and that most teachers are not English home language speakers. The experiential accounts of Mr Legend and Mr Nothile suggest that teaching for their learners continued in isiZulu up to high school despite their school's official language of teaching and learning being English. Supporting isiZulu language use in schools, a framework by the Department of Basic Education (2018) recognises the importance of incorporating learners' home language when teaching learners who are not English home language speakers. It is evident in both Mr Legend and Mr Nothile that their experiences of learners' use of isiZulu from primary school presents them with a situation where their learners are more '*comfortable*' (line 589) with using isiZulu for both communication and learning.

During the lesson observation of Mr Mathonsi, despite using both isiZulu and English to deliver his lesson on measurement, he switched to mostly use isiZulu when facilitating a discussion towards the end of the lesson. Mr Nothile's experience of how isiZulu encourages increased participation coincides with Mr Legend's observation of how isiZulu makes his learners '*fall in love with the subject*' (line 590). Allowing learners to engage in their home language enables them to communicate their ideas more freely in the classroom, this also boosts their confidence in the subject (Wild-Cromarty, 2018), otherwise, if teachers enforced sole use of English despite learners having a different home language experience, what they teach is likely to lose relevance in learners as they cannot bring it closer to their thoughts with ease (Bell, 2010).

4.4.2. IsiZulu and Mathematical Language

The language experiences of all three participants in the study suggests that mathematics has its own language that can be communicated using either isiZulu or

English. In expressing this experience, Mr Nothile states that he uses '*isiZulu with mathematics terms*' (line 201), his response provides a distinction between IsiZulu as a language, and mathematics having its own concepts. Sharing a similar experience, Mr Mathonsi tells of how he places emphasis on his learners knowing '*maths terms*' (line 1012), coinciding with an account by Mr Legend that '*isiZulu is for communication*' (line 585) and '*mathematics has its own specific mathematical terms*' (line 584). Supporting the establishment of the distinction language is Essien (2018) when he states that teachers concerned with effectively teaching their learners to succeed in their studies must separate between everyday 'social language' and the formal 'academic language' (p. 56). This separation is important for both the teachers and learners of mathematics as it allows for the focus to be on the mathematics.

4.4.3. Teaching Strategy

In group work arrangements, Mr Legend explained how he monitors his learners as they work on a given activity because he finds if this is not done, he would think that they are engaged in their learning but only to find that they are '*talking about their own stories*' (line 705). Responding to learners socialising more often than they focus on the given tasks, Le, Janssen and Wubbels (2018) identified friendship groups as a leading factor to ineffective groupwork. Mr Mathonsi's experience of his learners working collaboratively extends to when they are solving maths problems during their study sessions in the morning and afternoons. Mr Nothile shares of how his learners also help each other.

It is imperative for teachers to know the learning style preference of learners because the learning style of learners vary from one learner to the next because they are not the same in different teaching environments (Bosman & Schulze, 2018). Despite all three participants in this study emphatically sharing their experiences of how they allowed engagements among learners in their mathematics classroom, a purposive class discussion was only observed in Mr Nothile's lesson on measurement, it was facilitated through probing questions which learners responded to and engaged on the mathematics classroom. With all three participants stressing the importance of facilitating lesson talk through questioning, only Mr Nothile facilitated a class discussion, with Mr Mathonsi and Mr Legend allowing learners only responding to questions asked during the lesson. However, both Mr Mathonsi and Mr Legend

expressed the importance of allowing learners to engage among themselves, a strategy that they reserve for extra classes or study sessions that took place outside school hours, this allows more capable learners to explain to their peers in the classroom.

Despite not observing a group setup when visiting the participants, they all expressed their experiences of how they use collaborative learning in their mathematics classes, especially during extra classes. Supporting groupwork, Chan and Idris (2017) view organising learners into groups to perform given mathematics tasks as a form of a learner-centred teaching approach, which has been accepted as an effective strategy in the classroom for addressing the challenge of poor mathematics scores (Nsengimana, Habimana, & Mutarutinya, 2017).

4.4.4. Experience of Mathematics Teaching and Learning Time

The participants in this study expressed their experiences of the challenges meted by teaching mathematics to learners in a rural high school, the difficulties included a challenge of not being able to cover the syllabus on time. All the participants expressed the importance of covering the content before learners write their quarterly and yearly assessments so that they have enough time for revision prior to writing their formal assessments. They see content coverage as important for learners to acquire the requisite skills for the grade, which is needed as a foundation for the upcoming grades, du Plessis and Mestry (2019) highlights the detrimental effects of a teacher teaching quickly for the sake of completing the syllabus without being concerned by the quality of their teaching for understanding. Quality teaching does not happen when learners are being left behind by the teacher's instruction, often, when the teacher focusses on completing the lesson or the syllabus in quickly, they leave learners behind.

Teachers participating in this study shared their experience of learners who are lacking in their basics learnt in earlier grades, otherwise known as prior knowledge. An awareness of such learners in need of special attention is crucial for a teacher to plan and organise their classroom instruction, Ed-Adl and Alkharusi (2020) advises that dealing with such learners requires a teacher to create an environment where they are free to express their ideas and interact with learners who are good with their

mathematics, all this be done in order to monitor their progress as they learn to take responsibility for their learning.

4.4.5. Experience of Resources for Maths Teaching and Learning

There is a shortage of resources in the rural high schools where all three participants teach according to their experiential accounts which were supported by the observation I made on their visit as they delivered a lesson on measurement. The only visible resources on some of the learners' desks were calculators and textbooks (with some sharing), with some few desks with rulers on all three lessons observed. Enu, Agyman and Nkum (2015) advising on teaching resources assert that mathematical models, geometry sets, and other instruments and learning aids are important resources for improving learners understanding of a mathematical concept. Commenting on the impact resource shortages have on his teaching, Mr Nothile has resorted to teaching those without calculators solving without its use, while those with calculators solve using calculators, a strategy he regrets places those without at a disadvantage, this strategy he adopts because there is also a rife theft of calculators among learners, so his lessons must go on.

During the interview session, with Mr Legend and Mr Mathonsi, they both sought a different approach to responding to some of their learners not having calculators in their mathematics classrooms. The strategy they both shared is teaching their learners to borrow calculators from other classes or grades to use when it is a mathematics lesson, this they both shared, helps them all learn how to punch a calculator because not all mathematical operations can be done without a calculator at the level which they teach. The underlying cause of lack of resource shortage is the poor economic status of parents, who are not able to provide both the immediate home and school needs of their children. Reporting on the status of rural schools, du Plessis and Mestry (2019) observed the general lack of basic resource provision, such as a proper physical space, electricity, textbook, and other resources that overshadow and undermine the realisation of the desired curriculum outcomes.

During the lesson observation of all three teachers teaching measurement to grade eleven learners, they all used the chalkboard to demonstrate models and their net diagrams. Moreover, they all improvised three dimensional models by using a cylindrical dirt bin, redbull empty can, toilet roll inner core, and used rectangular chalk

box, ice-cream container, classroom dimensions, while also using learners' imagination of shapes they were familiar to, like: a rondavel- for cylinder and a cone, and JoJo tank- for an enclosed cylinder example. Much of the teachers' demonstrations considered learners' contextual realities with shapes and objects that were readily available inside the class or around the school.

4.4.6 Teachers Experience of Learner Background

As I interviewed the participants in this study, they all displayed sensitivity to the plight of their learners' impoverished home backgrounds which are lacking in support and motivation. Mr Nothile's experience of his learners' home situation affects his learners in that they have no time to study once they reach home because of the chores they are expected to do, and there is little motivation for education because of lack of exemplary people within the community to act as role models for his learners, what is rife in the community is poverty and unemployment. Mr Mathonsi's experience appears to be of learners who are heading their families, having been orphaned some have the responsibility of taking care of their siblings, as well as of themselves.

On further comparison, Mr Legend's situation is similar to that of Mr Mathonsi, where his learners come from unfavourable home background situation where some only receive a meal at school, they live in abject poverty, which leads to some lacking in motivation. Learners who are hungry cannot study effectively (Francis & Webster, 2019). Similarly, a TIMSS working paper series reported that learners' subjective well-being is an important factor to consider for learners' mathematical achievements (Fadiji, 2022). All the participants experience of their learners' background situation paint a picture of learners whose learning only take place at school. Hence the teachers devising strategies for learners to spend more hours at school learning, rather than giving them work that they are to do at home, because home presents them with realities that do not favour their schoolwork productivity.

A study by Mutidi and Ngirande (2014) found that learner's interest, family background as well as their confidence were indicators for possibilities for higher achievements than those learners who simply relied on their natural talent for their academic success. The rural schools that participants teach in are quintile one to three, Ramnarain and Hlatshwayo (2018) writes that schools found within the first three quintiles are in areas defined by socio-economic deprivation and are regarded as 'no-

fee schools.’ All the participants expressed an experience of learners who come from poor backgrounds, this experience was observed in how they lacked the basic resources and their appreciation of the feeding scheme, which Mr Legend lamented does not adequately cover the learner as they are unable to get the food outside schooling hours. Describing the status of the community which the schools are in, du Plessis and Mestry (2019) report that parents of learners in rural communities have low levels of education, do not attach value to education, and make a living from performing menial jobs, all this has an impact on their children’s education from motivation and support material provision point of view.

4.4.7. Attitude and Motivation

The experiential account of Mr Nothile on his learners suggest that some have a poor attitude towards mathematics, this he noted in how they ‘*do not do their schoolwork*’ (line 150). Mr Mathonsi shares the same sentiment when sharing the experience about his learners and mathematics in his class, as he explains how he finds some to be ‘*lazy*’ (line 851) which subsequently affects their performance. The lack of motivation among learners was also noted by Mr Legend, he identified a negative mentality towards mathematics among some of his learners, who have a belief that ‘*maths is difficult*’ (line 492) which he must deal with before teaching them.

A study on the perceptions that learners’ have about mathematics performance in South Africa found it was mainly due to their own confidence and interest in mathematics as a subject, home and family background, teachers’ commitment, the supporting material for teaching and learning, traditions and beliefs harboured by learners themselves (Mazana, Montero & Casmir, 2019; Mutodi & Ngirande, 2014). Teacher knowledge of learners’ attitudes about mathematics assist them to respond to learners learning needs, additionally, the motivation of learners, perception of subject relevance to their development and future growth, beliefs and their ability to work without supervision and monitoring are important for learners’ development in mathematics (Ed-Adl & Alkharusi, 2020).

The common theme in the experiences of teachers’ view of their teaching mathematics to learners in rural areas is the motivation of learners. The central determinant for learner achievement in mathematics is their love for the subject, in the experience of Mr Nothile, ‘*when a learner loves mathematics, they will grasp it*’ (line 429), sharing

this experience, Mr Mathonsi tells of how '*learners themselves amaze us*' (line 1164) by their level of mastery of the subject when they are committed. While in Mr Mathonsi's experience the commitment of learners towards mathematics comes as a result of being '*strict*' (line 1062), although he also shares of how learners experiencing home challenges should not be treated harshly when dealing with them. Mr Legend's approach appears to be softer, as he shares how he talks '*nicely*' by '*encouraging them*' (line 552) to see themselves as '*the solution to changing their home situation*' (line 531). It appears that this strategy by Mr Legend works, as he tells of how '*they begin to show love for mathematics*' (line 506).

4.5 Summary

A methodology followed in IPA research strives to provide a description of the experience as it appears to the participant and makes an interpretation of the experience because all phenomena are subject to interpretation (Pietkiewicz & Smith, 2014). This chapter dealt with the presentation and analysis of each case on its own terms, this was done by supporting the analytical process verbatim quotations. During the analysis process, it is important to engagement with existing literature for the interpretation of data (Kacprzak, 2017). Upon completion with the discussion of each of the participants, an analysis across cases for similarities and variances is undertaken to understand the meaning attached to experiences by the research participants within their context. This chapter provides an analysis of the participants' narration of their experiences, this is done by viewing the data against or in support of scholarly literature. Given that the main objective is to preserve the voice of the participant during the analysis phase (Kirn, et al., 2017), this is consistent with IPA studies.

CHAPTER FIVE

DISCUSSION AND CONCLUSION

5.1 Introduction

To attain depth in interpretation, the previous chapter placed attention on the participant's own words in presenting the data for analysis. This allows for the formulation of 'more conceptual and abstract findings' (Kacprzak, 2017, p. 63) that are discussed against existing literature. This chapter presents a discussion of the experiential accounts of the three participants and produces findings for this study, and lastly, the conclusion sums up this chapter, revisiting and restating noteworthy findings which are also summarised in the summary section.

5.2 IsiZulu and Mathematical Language

All the participants in this study taught learners whose official language of teaching and learning in their primary schooling was isiZulu, a home language of learners. This is the case for 80% of South African schools after the third grade onwards (South African Department of Basic Education, 2010). Learners enrolled in the rural high schools where the participants of this study teach mathematics attended primary schools within the rural community of Ndwedwe, in KwaZulu-Natal, where isiZulu is the home language of majority of learners and teachers. In all three observations of lessons on measurement, the most frequently used language by learners was isiZulu, this was led and guided by the teacher throughout the learning session.

The abstract nature of mathematics presents it as a challenging subject whose teaching and learning in a language that is not the home language of learners place an additional cognitive demand on the learner who has to first understand the second language, then try to understand the mathematics, the results of this are detrimental to the learner (Robertson & Graven, 2019). With all the mathematics teachers participating in this study sharing how their learners use isiZulu to communicate mathematical ideas and to ask questions, these experiential accounts were corroborated by the lesson observations.

A study on the transition of learners from learning in their home language to English in township schools revealed that learning in a second language leads to learning

losses for learners (Mabe and Pule, 2023). The study called for curriculum developers to address the development and enrichment of indigenous languages. Although the findings of the study focused on the transition of learners in primary school, it is evident that learners whose learning takes place in their second language prefer to use their home language given the findings also obtained by this study. The freedom that all three participants of this study gave to learners openly communicating mathematics in a language they are most comfortable with, is supported in the comparison made between social and academic language, that learning academic language in a language that is not the home language of the learner is more challenging than learning it in their home language (Cummins & Swain, 2014; Street & Hornberger, 2008). The lack of mathematics register in indigenous languages and assessments being carried out in English lead to teachers using isiZulu to communicate mathematical ideas, code switching and translanguaging to explain concepts, while focusing on the mathematics, much of the communication is done using learners' home language, isiZulu.

The three participants in this study shared their experiences of how they focused on the mathematics, preserving mathematical concepts and terms, only using isiZulu to explain the mathematics vocabulary, which they also teach. The interview responses of teachers' experiences and the lesson observations showed how teachers encouraged learners to engage in maths talk in the classroom and among themselves, openly using isiZulu to communicate mathematical operations in class. Allowing learners to openly use their home language to communicate in the classroom creates an environment where they are not limited by the English language to ask and respond to mathematical questions. This finding is consistent with Cummins (1999) who cautions teachers against assessing learners' 'formalized mathematical thinking' in their second language and believing that their lack of fluency in their second language equates to lack of mathematical proficiency and label them as 'learning disabled' (p. 5).

According to the experiences of the participants in this study, learners learn best when they are allowed to engage in mathematics talk in their home language. They all stress the importance of teaching learners the correct mathematical terms as they are written on the textbook but use isiZulu to explain what they mean. They facilitate classroom discussions, with learners organised into groups so that those who understand better

can share their understanding with their peers, mostly during extra classes or study sessions when engaged with class exercises.

5.3 Teaching Strategy

The experiential accounts of all three participants of this study mentioned how they organised learners into groups, allowing those who display a better mathematical understanding to explain to struggling members of the group as they learn collaboratively. However, during lesson observations, none of the participants were teaching in classrooms with a group arrangement setup, an arrangement that participants indicated they effected during extra-classes, in which learners work collaboratively assisting each other. The method of arranging learners who possess more knowledge with their peers in need of special attention is welcomed as an effective teaching and learning strategy (Ukobizaba, Ndiokubwayo, Mukuka & Uwamahoro, 2019), this is supported by Vygotsky (1962) on the importance of a learner's involvement in their learning, supported by a more capable peer to perform tasks that they otherwise would not achieve without assistance.

Facilitating classroom discussions is supported by Aloquina and Marpa (2016), their study found that allowing learners to discuss mathematics allows them to provide their perspectives about the given problem and incorporating original problems help learners see the importance of mathematics in their real-life situations. Explanation was done by referring to chalkboard drawings of three-dimensional shapes and their net diagrams, while demonstrations were made using container artefacts and examples of structures learners were familiar to, such as a rondavel and a cylindrical JoJo tank. Teaching mathematics in rural contexts requires a teacher to adopt a realistic mathematics teaching as an approach by giving learners real life problems that learners can relate with as they solve with their mathematics tasks in the classroom, this realistic teaching approach assists learners to resonate with the mathematics and enable them to improve their communication skills in the subject (Palinussa, Molle & Gaspertz, 2021; Gravemeijer, Stephan, Julie, Lin & Ohtani, 2017)

5.4 Experience of Teaching and Learning Time

The time for effective teaching of mathematics is never enough, because of the challenges of learners lacking in basics which are always needed as a foundation before the grade relevant skills are taught. This means that a teacher must reteach

content that learners are supposed to know from the previous grades before teaching what they are expected to teach. Moreover, the unsupportive home environment of learners require the teacher to create additional teaching and learning time at school in order for learners to have support and time to engage with the mathematics at school.

For teachers teaching and learners to be on par with the syllabus and the requisite work schedule or annual teaching plan (ATP), they resort to creating additional teaching time outside school hours where learners attend extra classes and also attend to a study at school to cover work done during normal school hours. Planning of extra time and study sessions by teachers is aimed at reducing the pace of the mathematics lesson, so that learners have enough time to engage with the content. A study by Mazana, Montero and Casmir (2019) suggest that teachers must focus on achieving depth rather than rushing to complete the syllabus that needs to be covered without learners having enough time to engage with the mathematics as required. Learners are advised to create time for them to do the mathematics outside school hours to improve their mastery of the subject. This study has found in the experiences of mathematics teachers in rural areas that to effectively teach all the syllabus, with the required depth, it becomes necessary to plan additional teaching and learning time at school for learners. The issue of nutrition has been brought forth by Mr Legend, and confirmed by both Mr Nothile and Mr Mathonsi as they explain the dire situation of poverty that their learners find themselves in, thus implying the need to extend the nutrition program to cover the extra hours that mathematics learners end up spending at school.

5.5 Experience of Learner Attitude and Motivation

Teachers shared an experience of how learners' attitude is the main determinant of their success in mathematics. When learners love the subject, they are able to devote more time doing maths and thus their performance improves. The fact that learners who attend rural high schools come from the same rural community, this presents them with the challenges of being demotivated and demoralised by their impoverished backgrounds. This situation is changed by the teacher, as they motivate learners to be the agents of change in their families, and also try to create an

environment where they are able to study at school. Although the challenges expressed by the teachers are demoralised learners.

The common underlying experience of Mr Nothile and Mr Legend is that when their learners love mathematics, they begin to master it, this experience is also shared by Mr Mathonsi. The love of mathematics by learners is instilled by a teacher in how they care for learners by supporting them and using motivation as they show the importance of the subject. When a learner is taught mathematics by caring teachers, they develop love for the subject and begin to enjoy doing it (Ukobizaba, et al., 2019). Expressing a similar experience, a study conducted by Tsanwani, Harding, Engelbrecht, and Maree (2014) on South African schools found that both teachers and learners' motivation and commitment were among prime factors for encouraging learners from impoverished backgrounds to persevere and excel in mathematics despite their context of deprivation. It is the position of this study that teachers play a crucial role in the motivating mathematics learners to fall in love with the subject, thought motivation and creating relevance by making the mathematics more realistic and contextually applicable in rural contexts.

5.6 Resources

The rural context within which this study drew its data is marred by mathematics teaching and learning resource shortages, ranging from calculators, models, and other teaching and learning aides in the mathematics classroom. The mathematics teachers participating in this study devised strategies to bridge the resource gap and make their lessons interesting. While performing an observation of participants teaching a lesson on measurements, all the teachers improvised by using different types of containers that are regarded as litter to use when making demonstrations as they explain in the classroom. The containers and objects used range from empty redbull cans, ice-cream container, toilet paper inner roll, chalkboard duster, chalk box, cylindrical dust bin, classroom dimensions, rondavel (hut), and other examples of shapes that were drawn on the chalkboard as net diagrams, with formulas. This strategy indicates that when a teacher is competent, they improvise with whatever at their disposal to facilitate learning in a mathematics classroom.

Moreover, supporting teachers' responses to their challenge of resource shortage when teaching mathematics, Laurens, Batlolona, Batlolona and Leasa (2018)

advocate for teaching that is sensitive to learners' contextual realities and challenges and adds that pursuing effecting methods of teaching mathematics to learners must follow a realistic approach to teaching that includes them solving problems they encounter every day so that mathematics has meaning in their lives. This was observed in the examples used in the classroom, for example, Mr Nothile creates a story using one of his learners during a lesson observation, saying: 'Mhlengi has a rondavel', as he points to a hut model drawing on the chalkboard, to depict a cylinder with a cone to bring his example closer to learners' context. It became evident in all the three participants' interview responses that it was their role as teachers in their classrooms that inevitably determined how their learners would progress in their mathematics learning.

The lesson observations showed the role of the teacher as being central to how learners learn in class. Du Plessis and Mestry (2019) report that the most important resource that has been proven to boost learners' performance in rural schools are quality teachers. This assertion was supported by how lack of resources in all three schools was supplemented by teachers' innovative use of artifacts and realistic mathematics examples that learners can relate with, that are context relevant for learners to link the mathematics with their daily reality.

5.7 Conclusion

This study has provided an investigation into the experiences of mathematics teachers in rural areas where their learners are isiZulu home language speakers. To achieve the objectives of the study, an Interpretative Phenomenological Analysis was adopted. The experience of learners' home language use for learning in a mathematics classroom is found to be crucial for encouraging learner participation, and for simplifying the mathematics. However, all the participants in the study maintained the use of mathematical language as independent from the language of communication, whether in isiZulu or English, this is supported by scholarly literature as it draws the distinction between social language and academic language, thus encouraging teachers to focus on the mathematics rather than mastery of social language. It was further noted that learners come from poor and unsupportive family backgrounds negatively affects their learning of mathematics.

To combat the unsupportive home environment of learners, teachers have resorted to planning additional teaching and learning time outside of normal school hours in the mornings and in the afternoons. The extension of mathematics learning time within the school in the form of extra classes and study sessions is aimed at addressing the twin challenge of learners' lack of requisite prior knowledge whose teaching consumes time allocated for grade relevant content, and to bridge the space and time gap created by learners' unsupportive home environment. Considerations are required to cater for an extended nutrition program to cater for mathematics learners who are at school for study sessions and extra classes given that their impoverished backgrounds do not allow for them to bring lunch to school to cover the additional time they need to spend at school doing mathematics. The study has also found that teachers play a major role in the motivation of mathematics learners to fall in love with the subject, to design lessons to be context relevant and interesting despite the challenge of resource shortages. It is the teachers' innovative lesson delivery that incorporates demonstrations using containers, models around the classroom to show learners examples of the shapes measured in a measurement lesson observed.

5.8 Summary

This chapter has presented a discussion of the study's findings and a conclusion. The discussion draws from the data presented and analysed in chapter three, viewed against existing literature, the discussion produces findings that home language use by learners in the mathematics classroom allow for better participation, but the mathematical language remains unchanged regardless of the language learners elect to communicate with. Moreover, a challenging learner background and resource shortages experienced by mathematics teachers requires them to create space and time for learners to practice mathematics at school, while teachers improvise to make their teaching relevant and realistic to learners' context, for example by using common artifacts to model shapes. The extra mathematics lessons help teachers cover the syllabus and study sessions allow for learners to engage with mathematics collaboratively at school before they leave in the afternoon and before school starts in the morning. The motivation of learners is crucial if they are to be successful in mathematics learning, this also relies on a teacher becoming the motivation to learners and making the subject interesting and fun.

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17 October 2022

Sifiso Phoswa (214501310)
School Of Education
Edgewood Campus

Dear S Phoswa,

Protocol reference number: HSSREC/00004557/2022

Project title: Teaching mathematics to IsiZulu home language speakers in rural high schools: A study of teachers' experiences

Degree: Masters

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 05 August 2022 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

This approval is valid until 17 October 2023.

To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

HSSREC is registered with the South African National Research Ethics Council (REC-040414-040).

Yours sincerely,



Professor Dipane Hlalele (Chair)

/dd

Humanities and Social Sciences Research Ethics Committee

Postal Address: Private Bag X54001, Durban, 4000, South Africa

Telephone: +27 (0)31 260 8350/4557/3587 Email: hsrec@ukzn.ac.za Website: <http://research.ukzn.ac.za/Research-Ethics>

Founding Campuses:  Edgewood  Howard College  Medical School  Pietermaritzburg  Westville

INSPIRING GREATNESS

APPENDIX A

INTERVIEW TRANSCRIPTS

Participant: Mr Nothile

Usunesikhathi esingakanani ufunisa izibalo?

How long have you been teaching mathematics?

1 Isikhathi esenginaso ngifundisa izibalo u-4 years, kodwa lonyaka oka-5, ngaqala ngo
2 2018 njengoba lonyaka seku-2022. Ukuqala kwami ukufundisa, kushuthi ngathi
3 ngiqeda enyuvesi uthishomkhulu wangasekhaya wase engibiza ngoba uthisha we-
4 mathematics wayengekho kulesoskole kushuthi kwakusanda kuhamba laba aba
5 ama foreigner, wase engibizake ukuthi ngizobamba. Ngangisaphuma enyuvesi sengi
6 qualify-ile kuwukuthi ngingaka graduate kusaqala unyaka, wayesengibiza ngoba
7 wayengazi eskoleni ukuthi vele ngangibukhali esibalweni kanti futhi nezingane
8 ngangizisiza. Kwathi kodwa ke kwafike kwaba uJanwari, kwa uFebwari, kwathi ngo
9 Febwari usuphela ngaseke futhi ngathola imeseji ethi angize eMaritzburg, ithi angize
10 kuleskole engikusona kushuthi lesikole esesibili ngikuso, noma kungekho i-experience
11 etheni engayithola kodwa impela leskole esesibili.

12 *I have been teaching mathematics for four years, this is my fifth year since I started in*
13 *2018 and it is now 2022. I started teaching on a call up by the principal of my former*
14 *high school back at home, the principal called me up to work temporarily because they*
15 *did not have a mathematics teacher at the time since the teachers who were foreign*
16 *nationals had left. I had just got out of university, fully qualified, but had not gone for*
17 *graduation as it was still at the beginning of the year, the principal then asked that I*
18 *come and assist because he knew how sharp I was in mathematics and knew how I*
19 *used to help other learners, back from when I was still a learner at the school. I*
20 *assisted from January, February, then towards the end of February I received a*
21 *message calling me to Pietermaritzburg and instructing me to come and teach at this*
22 *school, so I can say that this is my second school teaching, although I cannot say I*
23 *received much experience from my first, but this is my second school.*

Ngabe ukhona umehluko endleleni obufundiswa ngayo izibalo nendlela ofundiswa ngayo izibalo?

What experiences can you share on how you were taught mathematics when you were still at school and how you were taught to teach mathematics at college/university, are there any notable differences in your current practice?

24 Esikoleni uthisha, babehlukene ke othisha ngoba ka grade 11 kwabakhona omunye
25 uthisha we-maths, ka grade 10 kukhona omunye uthisha, bese kuthi ka grade 12
26 kukhona omunye uthisha futhi. Ngaleziya zikhathi zethu masifunda kwakhukhona
27 labothisha aba ama foreigner, ka grade 10 ngangifundiswa uthisha othola ukuthi yena
28 ufundisa i-maths ufaka isiZulu bese ezofaka futhi i-English ukuze kushuthi ihambe
29 kahle ngendlela yakhe ukubona, ukuze wonke umuntu ayibone ngendlela yakhe.
30 Kanjalo futhi naka grade 11 kwakukhona lo owayekhuluma isiZulu aphinde futhi
31 akhulume i-English. Kodwa ka-grade 12 ngase ngifundiswa uthisha owaye i-foriegner
32 owayekhuluma nje i-English kuze kuyovalwa, kodwa ngaso sonke isikhathi
33 intengangiyibuka kuyena kwakungukuthi wayefundisa i-maths nge English ngesizathu
34 sokuthi wayengasazi isiZulu ngoba wayeke ezame ukuthi uma efuna mhlampe ukuthi
35 ayi-emphasize lento ayishoyo wayezama ukuthi akhombe ingane athi 'awuyichaze
36 lento ngesiZulu' ambonayo ukuthi ngathi uyayizwa athi "ake uchazele abanye
37 ngesiZulu bethi ukuyi-understand". Into engangiyithola kuyena lo waka grade 12
38 ngisakuyena wayenako ukuthi i-English yakhe azame ukuyi-breaker down ibe kwi
39 level ukuze sizokwazi ukuthi siyizwe kahle lento ayishoyo ikakhulukazi kwi
40 mathematics.

41 Mangifika e-University, ngangiyifunda nje nge-English ngoba ama-Lecturer ami
42 wawuthola ukuthi kukhona owuMsuthu, kukhona i-Bhunu, uyabona kukhona
43 Amandiya, kugcine kushukuthi manje ngiyifunda ngani ngiyifunda nge-English.
44 Kodwake into eyayisisiza thina lapho kwaba ukuthi sasike sihlale as i-group mangabe
45 siye e-library ke-siyihlaziye lento yethu ngesiZulu nomunye aqhamuke nokwakhe
46 ukuthin uyibona kanjani nomunye ukuthi uyibona kanjani, ngaso isiZulu lesi, ngoba
47 vele indlela ingqondo esicabanga ngayo isesiZulwini.

48 *At school I was taught by different teachers, because at grade 11 I was taught by*
49 *another maths teacher, at grade 10 I had a different teacher, then at grade 12 I also*
50 *had a different teacher. Back then when I was still at school we had foreign national*
51 *teachers, at grade 10 I was taught by a teacher who taught maths using both isiZulu*
52 *and English so that the lesson achieved its objectives in their view, so that all learners*

53 *could understand. Again, at grade 11 I was taught by a teacher who spoke both isiZulu*
54 *and English. However in grade 12, I was taught by a teacher who was a foreign*
55 *national and spoke English from start to finish, but what I observed from this teacher*
56 *was that he taught maths using English because he did not know isiZulu, this I could*
57 *see whenever he wanted to emphasise something he would point at a learner and say*
58 *“explain this in isiZulu” asking a learner who appeared to understand better and say*
59 *“just explain to others in isiZulu for them to understand”. What I noticed from my grade*
60 *12 teacher while I was still in his class, was that he tried to use simple English, he*
61 *broke it down to our level for us to understand what he was saying, especially in*
62 *mathematics.*

63 *When I got to university, I learned mathematics in English because my lecturers were*
64 *either Sotho, Afrikaner, Indian, so this at the end it meant I would be taught and learn*
65 *using English. What assisted us then was that we would sit as a group at the library*
66 *and analyse the mathematics lecture using isiZulu, with each sharing their view and*
67 *understanding in isiZulu, because the thought process happens in isiZulu.*

Ikuphi ongakuphawula ngokufundisa izingane izibalo kulendawo yasemakhaya?

What experiences can you share on your teaching of mathematics to your learners who are isiZulu home language speakers?

68 Ngiqale ngo 2018, ngafika ngoMashi 2018 ngingenayo kahle kahle i-experience so
69 ngangizama ukuthi ngifake i-English ngizame ukuthi yonke into yami ngiyichaze nge
70 English. Ngizame ukuthi nezingane ukuthi mangabe zi-responda kumina ziresponde
71 in English, 'iEnglish i-medium of instruction' ngangi-emphasizer, ukuthi “you must
72 speak English, mawuphendula phendula ngeEnglish”. Kodwa kuthe mangabe
73 sekuphuma ama results okuphela konyaka ngonyaka wokuqala ngabuka ukuthi
74 akukho okutshengisa ukuthi kade ngifundisa la, abezwanga, uyabona nje ngoba
75 bengikwenza loku i-term ngibone ukuthi kuyabheda, ngiphinde ngikwenze enye i-term
76 ngibone ukuthi ama results awekho kahle. Ngase unyaka wesibili sengifundisa
77 senginespiliyoni sonyaka, ngoba nje i-percent lami lali laphaya ko 18% kwi-
78 mathematics 2018, bese kuthi kulo nyaka wesibili ngase ke ngitholake manje ukuthi
79 kukhona leyo experience encane sengibabona ukuthi lezingane kahle kahle
80 ezasemakhaya ziqhamuka emakhaya angafani, kanjalo futhi kusemakhaya ama
81 primary azo ngoba sezila eHigh school awafani, kukhona ebiveli nje kusukela

82 ePrimary ibifundiswa ngani, ngesiZulu yonkinto isiZulu kufakwa isiZulu, so mangithi
83 ngiqhamuka nge English khona izinto abalahleka khona, kunamagama abangakwazi
84 ukuwabona in English kodwa mawusubeka ngesiZulu ubona kalula ukuthu uqonde
85 ukuthini. So nje ngingasho ukuthi ngase ngithi ngonyaka olandelayo ngase ngithi
86 kancane ngifaka isiZulu mangabe sengifundisa ngifake isiZulu, mangifundisa ngifake
87 isiZulu, iEnglish.

88 Ngoba iEnglish ngiya emphasize, kufanele kubekhona amagama usuku nosuku
89 engiwafakayo i-vocabulary yabo, kufanele ngiwafaka abalulekile ikakhulukazi ko
90 maths njengo-factorization loko kufanele bekwazi 5 ways of factorization ukuthi
91 kuqonde ukuthini, intersection isho ukuthini kuma functions, lawomagama kumele
92 ngiwachaze ngazo zonke indlela. Ngoba abanye nje baye badidanise i-reflection ne-
93 inverse, ukuthi kuhamba kanjani uyabona so ngike ngizame ukuthi ngikuchaze
94 ngesiZulu ngiphinde ngikubuyise futhi kuyo iEnglish ngoba bazophinde babhale futhi
95 iphepha elibhalwe nge English elingabhalwanga ngesiZulu. So ngabona lapho kune
96 improvement nyana ngabona kusuka ku 18% sekuthi xaxa ku 40%, ngabona ukuthi
97 kuyanyuka, ohh sebeyezwa manje. Okunye engike ngikubone ingane zasemakhaya
98 nje othole ukuthi ayizwa, enye nje inenkinga kuma basics, enye vele ayinaso isikhathi
99 salento, ayiboni noma ayikuboni ukubaluleka kwayo. Ngenxa ye-environment,
100 ukugquqguzeleka akukho kushuthi nasekhaya, kushuthi uyafunda kodwa akukho nje
101 amubonayo ekhaya omu-motivate'ayo, ingakho enganaki akakuboni nje lokho, and
102 sinenkinga nje yezingane otholukuthi zikanjalo. Utholukuthi i-motivation akekho
103 motivated ukufunda, uyayenza nje i-maths ngoba kuthiwa akayenze noma wezwa
104 kuthiwa kunemisebenzi mawenza imaths kodwa akaze ayibone.

105 Ngenkathi ngifundisa ngizobuza into engike ngayikhuluma izolo e-simple ngithole
106 ukuthi usekhohliwe, mangikulandelela ngithole ukuthin even nemisebenzi akayenzi
107 nje yesikole, and i-mathematics if umsebenzi ungenziwa, ngoba imathematics is a
108 practice, practice every day if you keep on practicing izongena ekhanda, umbone
109 ukuthi akayi practice every day, akekho motivated ukuthi ayenze everyday lento
110 akayenzi uyabona ukuthi ngaso sonke isikhathi mayebhalile i-homework yakhe
111 izofana neka mngani wakhe. Izone zinto lezo oke uhlangane nazo uma uhamba la
112 eklasini ubone ukuthi kushuthi akukho ngaphakathi kwakhe ukuthi wenza lento.
113 Uyenza ngoba mhlampe weza la ngoba ebona umngani wakhe.

114 *I started teaching in March 2018, I did not really have teaching experience then, so I*
115 *used to deliver my lessons in English, I used to try explaining everything in English. I*
116 *also used to encourage my learners to respond to questions asked in class using*
117 *English, 'English is the medium of instruction' I emphasised to them that their*
118 *responses and contributions must be in English. On analysis of the final learners'*
119 *results after the end of my first year, it was as if no teaching was done, their*
120 *performance to me suggested that they were not understanding. In that year, I had*
121 *taught in English for term after term to no improvement in results, in fact my learners*
122 *results were bad. In 2018, my learners pass rate for mathematics was 18%. Then,*
123 *during the second year, armed with a full year of experience of my learners and their*
124 *varying backgrounds, from home to primary schooling based in a rural community,*
125 *which means there are learners who from primary school were taught in isiZulu,*
126 *everything had been taught in isiZulu. So, much of my teaching in English was leading*
127 *to losses in learning as they could not understand some of the words used in English*
128 *but could easily understand their meaning when taught in isiZulu. So I can say that*
129 *during the following year I used isiZulu in my teaching, I used both isiZulu and English.*

130 *English, I emphasise that it is important for me to include some terms in my teaching*
131 *as part of their daily vocabulary, especially in maths there are important terms like*
132 *'factorisation', they must know what 5 ways of factorisation means, they must know*
133 *the meaning of 'intersection' in functions, so the meaning of such terms must be*
134 *explained in every way possible. Some of them, you find, confuse reflection with*
135 *inverse, so I try to simplify the meaning and applications of such terms in isiZulu, and*
136 *in English because they are assessed in a paper written in English, it is not written in*
137 *isiZulu. So, I started to see some improvements in their performance, a move from*
138 *18% to 40%, this slight increase indicated to me that they now understood better. What*
139 *I also experience here is that a learner from a rural area who has a learning difficulty,*
140 *is challenged because he or she does not have sufficient understanding of the basics,*
141 *some you may find do not have time for this, you know they simply do not see its value.*
142 *Their lack of motivation is because of their environment, there is no encouragement*
143 *even at home, he or she goes to school but there is no one they look up to from home*
144 *who is motivating them, this is the reason why they are ignorant, they simply lack*
145 *motivation, so we have a challenge of learners who are like that. Learners who are*
146 *simply not motivated to learn, who do maths because they were told to or heard that*

147 *maths will expose them to employment opportunities, but they have never seen such*
148 *jobs.*

149 *When I teach, I will ask just a simple question based on yesterday's lesson only to find*
150 *that he or she has forgotten, and when I follow to look closely, I find that they do not*
151 *do their schoolwork. Given the nature of mathematics, as a subject demanding daily*
152 *practice in order to master it, you will find that a learner does not practice daily as*
153 *expected, they are not motivated to practice maths every day, they simply do not work,*
154 *and on days where they have done their homework, it will be the same as their friend's.*
155 *Those are the kinds of things you will find going around the class, a learner who does*
156 *not have the passion to do this thing. He or she does it because they came here*
157 *following a friend.*

Ngesikhathi ubanikeza umsebenzi, baba kanjani ngokwesipiliyoni sakho, bakhuluma kanjani, basebenza kanjani eklasini lakho?

What experiences can you share on how your learners interact when you give them work? 13:40

158 Eklasini sine teacher centred ne learner centred, bayakuthanda kona ukuthi 'siyafisa
159 Sir ukuthi siye phambili' maku usuku labo lokuthi baye phambili wonke umuntu uya
160 phambili, bashaye leyo sum noma leso sibalo leso engisuke ngimunike sona phambili,
161 bayathandake ukuthi mayesishayile uyafisa ukuthi asichaze, ngenkathi esichaza
162 ngiye ngibone ukuthi ngendlela abasichaza ngayo ngiye ngithi abasichaze ngaso
163 isiZulu, ubone ukuthi bayakhululeka. Mangithe English kunamagama abavimbayo,
164 uthokukuthi manje useyama, unakho ukuzenyeza ukwenza lento uyabona, kodwa
165 ngigcine sengithi chaza ngaso isiZulu, mayechaza ngesiZulu ubone ukuthi cha lento
166 uyayizwa, uyayibona lento ayibhalayo uyayazi. Bashintshane kanjalo, ngibuye
167 ngibahlalise ngama group, ku-discuss-we ngento ethize, ku-discuss-we mangabe kuyi
168 function yenziwe i-function kube khona abanye abayi-interpret-ayo ngapha,
169 kubekhona abanye abayi construct-ayo ngapha, bese kuba ke ukuthi lento ivame
170 ukwenzeka mhlampe ngaboLwesihlanu kanje. Sinayoke i-teacher centred, kodwa i-
171 teacher centred yami i-based kwi strategy soku questioner, ngisebenzisa uku-
172 questioner kakhulu mangifundisa yonkinto iqhamuka nabo igcine yakheka laphaya
173 ebhodini.

174 *In my class we use a teacher centred and a learner centred approach. They like saying*
175 *'Sir, we wish to go to the front', if it's their day to go to the front, taking turns they all*
176 *go to the front to present a solution for a problem I give for them to solve. Those who*
177 *have solved the problem correctly like explaining their solution to others, it is then*
178 *where I let whoever is explaining do so in isiZulu, a language they feel most*
179 *comfortable with. If I say they must explain in English, I notice that there are terms that*
180 *limit their expression, you find a learner stops explaining in the middle, you see them*
181 *lose confidence in what they are doing you know, so I end up saying 'explain in*
182 *isiZulu'. When they explain in isiZulu you can observe them regain their confidence*
183 *and how well they understand what they are explaining, they know what they are*
184 *writing. Taking turns like that, I sometimes arrange them into groups to discuss a*
185 *particular section, if it happens to be a function under study, others will be constructing,*
186 *and others interpreting on the side, this arrangement usually occurs on Fridays every*
187 *week. So, we do use a teacher centred approach, but my teacher centred approach*
188 *is based on questioning as a strategy, I mostly use questioning in my teaching, so*
189 *everything comes from them and is gradually developed on the chalk board.*

Ngesikhathi uyijikijela kubona kuyi learner centred noma i-teacher centred, iluphi ulimi abalisebenzisa kakhulu eklasini?

What experience can you share on the language used by your learners in your mathematics classroom?

190 Basebenzisa isiZulu nama terms aka-maths, ngoba indlela engifundisa ngayo
191 mangabe ngifuna ukufaka i-English nje ngizokwenza i-example, ngiye ngifake i-
192 vocabulary ngithi like 'what is a derivative?' sengiyababuza lapho sebezqhamuka ke
193 bathi 'derivative is a gradient at a point' sekuyisingisi leso abasizwa kangcono, kodwa
194 mangithi nje ngifaka i-question nje ngithi asiyi solve mase ngibuza umbuzo abakwazi
195 ukuphendula ikakhulukazi kwiteacher centred, mangithe English abaphenduli omunye
196 bayasaba bayasaba, omunye ubuka omunye ukuthi akakwazi ukukhuluma isingisi,
197 banako ukuhlekana. Kodwa mangabe kuvulelekile isiZulu nangu loya uyaphakamisa
198 ubona kuphakamisa oyedwa wangamkhuza ekhulume ngesiZulu ubona inqwaba
199 yezandla elandelayo kumbuzo olandelayo, okusho ukuthi sebefuna ukuphendula loku
200 akucabangayo sekulula ukuthi akusho ngoba usezokukhipha ngesiZulu.

201 *When they engage, they use isiZulu with mathematics terms, suppose I want to use*
202 *English for example, to teach vocabulary I'll ask, 'what is a derivative?' and they will*
203 *respond by saying 'derivative is a gradient at a point', now that is the English they*
204 *seem to understand better. However, if I give them a problem to solve and then ask*
205 *for the solution to be shared in English when using a teacher centred approach, they*
206 *hardly answer, they are afraid, they look at each other, with others looking at how their*
207 *peers don't know how to speak English, they do laugh at each other. When isiZulu is*
208 *used openly, you'll see many hands rising when their peer responds using isiZulu and*
209 *is not instructed not to use isiZulu, you'll see many more hands go up on the next*
210 *question, which means they now wish to share their thoughts as an opportunity is*
211 *presented to share in isiZulu.*

Sithini isipiloyoni sakho endleleni osuke ufundisa ngayo namathuluzi la emakhaya ikuphi okubasizayo ukulekelela ekufundiseni izingane izibalo?

As you teach here in a rural area, what are your experiences on resources tools for doing mathematics?

212 Amathuluzi emakhaya njengoba kumi kanjena nje awekho amathuluzi. Kahle kahle i-
213 material impela ku uwe uthisha la emakhaya, uyikho konke nje usuke eyiyona into
214 edingwa umfundi la emakhaya. Uthola ukuthi izinto nje ezikhona kuba iwona ama
215 protractor, nawo angasebenzi njalo mase kuba yini enye i-calculator, nayo i-calculator
216 imvamisa esebenzayo imvamisa ko grade 12, 11 abangenawo nawo bonke ngoba
217 sinayo inkinga yokuthi phela izingane ezasemakhaya, ingane zasemakhaya kwesinye
218 isikhathi enye ike isebenzise ukuntshontsha ukuze ithole something, ayebiwa
219 kwawona lama-calculator, bayantshontshelana bebodwa uthole ukuthi akanayo into
220 aka afford so njengoba enga afford nje ubona indlela elula ukuthatha athathele
221 omunye. So yizo zonke izinto esibhekana nazo masikhuluma nge material. Okudala
222 ukuthi ube nendlela mangabe ufundisa umuntu ukuthi akwazi ukwenza isbalo without
223 a calculator, umtshengise indlela zokwenza isbali esithize without a calculator, mase
224 kuthi mawune calculator usebenzise futhi indlela mangabe une calculator, njenganani
225 futhi ukwenza i-example njenge quadratic noma i-trinomial, i-trinomial uyakwazi
226 ukuyenza without a calculator uyenze if you know five ways of factorization, trinomial
227 uyakwazi ukuyenza. Kodwa mawune calculator futhi it is more than easy because now
228 you going to punch i-quadratic formula kwi calculator uthole ama solutions than

229 uwabuyise as ama factors. So uyabona ukuthi kuba nalokho ukuth lo one calculator
230 engathi yena okwakhe kuba lula, bese kuthi lo ongenayo i-calculator izinto zakhe ziba
231 nzima. Bese kuthi kanjalo ke abanye bengenayo i-calculator abanye bene calculator
232 indlela abafunda ngayo ayibe isafana ngoba abalingani kahle kahle.

233 *In a rural area such as this, we do not have learning tools as things stand. In all honesty*
234 *the main material here is you as a teacher in rural areas, you are everything a rural*
235 *learner needs. The resources you will find here are protractors, which are not always*
236 *in use, and calculators which are mostly needed and used in grade 11 and 12, and*
237 *are not enough as you know we are teaching learners from a rural area, a challenge*
238 *with teaching learners in a rural area is that some would use stealing to get something,*
239 *so it is very common for calculators to get stolen, they steal from each other. You will*
240 *find a learner who does not have a calculator maybe because they do not afford it*
241 *resort to stealing from another learner. So those are the kinds of challenges we face*
242 *when we are looking at the issue of teaching and learning material. As a teacher you*
243 *devise strategies for teaching a learner to solve a problem without relying on a*
244 *calculator, for example, a quadratic or a trinomial can be solved without using a*
245 *calculator if you know the five ways of factorisation, you can work on a trinomial.*
246 *Having a calculator makes solving more than easy, as you can insert the quadratic*
247 *formula on the calculator and find solutions on the calculator, which can then be written*
248 *as factors. So, a learner who has a calculator has their work cut out for them, working*
249 *is easier for them than it is for a learner without a calculator. Having a situation where*
250 *others have calculators and others do not have them means that their learning will be*
251 *different as these two learners are not the same and they will learn differently.*

Ikuphi ongasixoxela ngokukusizayo uma uzofundisa izibalo ebantwaneni bakho phezu
kwezinqinamba obhekana nazo?

What experiences can you share on how your planning is done for your lessons?

252 Ngisuke ngi-planile ukuthi ngoba vele ngiyabazi ukuthi basesimeni esikanjani, so
253 mangifundisa manje sekufanele ngifundise ngendlela yokuthi ngiba accommodate
254 bonke, kufanele ngizame ukuthi istry strategy sami, i-plan noma u-prep wami ukwazi
255 ukuba accommodate-a bonke. Indlela engiba accommodate ngayo bonke ukuthi ngi-
256 emphasize more kulezinto ezingama basics, ngiye ngiye ngibone ukuthi uma sebe-
257 strong kuma basics imibuzo eminingi abakwazi ukuthi bayishiye, noma uthola ukuthi

258 akasatholi yona i-answer nje ngqo noma itotal kodwa kukhona lokhu akutholayo. Bese
259 ngi-emphasize ukuthi ngibafundise nge questioning ukuthin ku-questioner kanjani so
260 that nobani nobani kube namamaki awatholayo azomphasisa ngiye ngizame lokho ke
261 ukuthi akujwayele ukuthi izinto ezilula ezizomphasisa, ngoba inhloso kakhulu kusuke
262 ku uku phasa. Nalo ongenayo i-material engalingani kodwa bonke bezame ukuthi
263 bephase, noma kungenzeki, kodwa ngiye ngizame ukuthi bephase.

264 *When I do my planning, I make sure I accommodate all of my learners needs because*
265 *I know their situation, so my teaching is planned in such a way that it accommodates*
266 *all my learners learning needs. I accommodate all of them by emphasising more on*
267 *basics, and I will see that they are stronger when they answer most questions without*
268 *leaving questions unanswered, even when they may not get the correct answer or get*
269 *total marks for questions asked, but they are able to answer and get some questions*
270 *correct. I then emphasise on using a questions-based teaching, show them how*
271 *questions are asked so that all my learners can answer the most basic questions, get*
272 *used to answering basic questions that will give them enough marks to pass, because*
273 *the main aim is for them to pass. Even the one without sufficient material as others*
274 *have must pass, although this is not always possible, but I try to make them pass.*

Engabe kukhona yini izimo la umfundi eba nezinqinamba zokuphendula iphepha ngenxa yokungaqondi language ngokwesipiloyini sakho?

In assessments, what are your experiences on how your learners respond to question papers?

275 Ngokwesipiliyoni sami mayebukhali ubukhal, mayebukhali ubukhali kusukela ka grade
276 11 naka 12 uzophinde abe bukhali futhi uyoze aphume ebukhali. Kukhona futhi uthole
277 ukuthi ba on the average level abanye utholukuthi along the way uya gain uya gain,
278 kukhona lezinto ezimshayayo, utholukuthi lezinto ezimshayayo, kodwa ngiye ngibone
279 ukuthi kwenziwa ukungafundisisi, omunye ngiye ngibone ukuthi akafundisisi. Abanye
280 ngiye ngibone ukuthi bashawa isimo lapha emakhaya, mayefika emakhaya abanye
281 indaba yemfundo yinto abazali lapha emakhaya babuye bangabi nayo indaba
282 nemfundo babafake emsebenzini, mayebuya eskoleni ungena emsebenzini
283 yasekhaya, uthi mawuphuma emsebenzini lapho usukhathele usuyalala, izona zinto
284 esibhekene nazo, ubone ukuthi bashawa ilokho ugcine manje ngoba phela i-practice
285 engadala ukuthi lesaskhala asishiyile angasitholi. Ngoba i-syllabus njengoba ngisho

286 ukuthi ngisuke ngifuna ukuba accommodate bonke ngenza sho ukuth ngiyiqeda
287 yonke, ngenzele ukuthi noma ungekho good kule chapter mhlampe u-good kule
288 chapter, nomungekho good kule chapter mhlampe ugood kule chapter, uyabona so
289 ngenza sho ukuthi ngiyazama ukuthi ngiyikhawe i-syllabus kusanekhathi esiningi se-
290 revision.

291 *In my experience if a learner is sharp, they will be sharp from grade 11 right up to*
292 *grade 12 until they exit schooling, they will be sharp. There are instances where you*
293 *find a learner is on a relatively average level and steadily improves, you can at times*
294 *see the things that are a problem to such a learner, which may be their lack of reading*
295 *properly. Some I find their background is what affects them back at home, some*
296 *parents, in a rural area such as this, do not care much about education but home*
297 *chores, so a learner coming from school will find home chores awaiting them, and by*
298 *the time they are done with these chores they are tired and go to sleep. Those are the*
299 *kinds of things we are faced with; you end up understanding what affects their lack of*
300 *time to practice in order to improve. I push to finish the syllabus so that I have all topics*
301 *covered in order to accommodate all learners, this I do to afford all learners with an*
302 *opportunity to identify and perform on chapters they understand better, understanding*
303 *that a learner might not be good in this chapter, but may be good in the next. So, I*
304 *make sure I complete the syllabus in advance so that I can have enough time for*
305 *revision.*

Kuye kukuphathe kanjani indlela abantwana abanga perform ngayo, ngibuze kuwona u 18% ukuthi waphatheka kanjani?

How did you feel on your 18% pass rate?

306 Ku 18%, ngangiqhamuke ngo-March kushuthi kwakusanekhathi, kodwa
307 ngaphatheka kabi kodwa ngangiveli ngilindele ukuthi ngoba ngafica vele ngathola
308 kubona ukuthi ngeke, mangibuka indlela ababebhala ngayo ngabona ukuthi
309 kusazofanele kusetshenzwe kanzima, kusafanele kusebenzwe kanzima. Ngoba u-
310 paper 2, ngoba phela sino paper 1 no paper 2, i-geometry ne-algebra, i-algebra
311 kwakunama gaps nakhona base kuthi kwi-geometry ke yayingabhalwa nhlobo,
312 nhlobo, nhlobo wawubona ukuthi abantu babhala amagungquluza kubhalwa nje kube
313 kanjalo, amagungquluza like nje ama theorems. If ama theorems kufanele sikwazi
314 ukuwashi ukuwa-state, sikwazi ukuwa prove, wawutholukuthi kunzima ukuthi

315 ungaqala usho i-proof. Ukufika kwami ngafika ngafundisa u-grade 12, and ugrade 11
316 awusekho ngoba kwenziwa kwa grade 11 konke lokho, ngoba kuba kuhle mangabe
317 ngibaqale ka grade 10, even nomunye utholukuthi washoda la uyakwazi ukuthi
318 ngimukhave ka 11 nakwa 12. Kodwa manje mangifika ka 12 like u2018 ngase ngithola
319 ukuthi kunama gaps amaningi, even nokudweba i-function was very difficult kanti
320 kwakuyinto elula ikakhulukazi uyakwazi ukuyenza i-table of value, uyakwazi ukuyenza
321 usebenzisa i-calculator straight usebenzise i-calculator ufake ama table values,
322 uyakwazi ukuyidweba i-function usebenzise ama asymptotes kuphela, kulula
323 asymptote iyaphuma bese kuba ama x and y intercepts. Uthokuluthi abanako ukuzi
324 understander, indlela aba construct ngayo i-function ayikho akuyona, utholukuthi kuba
325 nzima mase ku u12, ngaphusha kona ngoba khona lapho babekhona abantu abafana
326 ababezama ukuthi bazimisele, ngoba ukuzimisela kwabo bagcina bephasile.

327 Abanye ngafika vele sebelilahlile ithemba kwisibalo, umbone noma eklasini
328 uyazihlekela akanankinga ubhalile umsebenzi noma akabhalang kuyazifanela kuyena
329 wawubona ngo 2018 ukuthi kwakuyinto abasebeyijwayele ukuthi abawenzi
330 umsebenzi. Wawufika tholukuthi kwesinye isikhathi uyafika kukhona 13 eklasini
331 kodwa kwakuyiklasi labantu abawu forty something, kukhona 13 uthole ukuthi abanye
332 bayaphuma kwakusenenkinga yokuthi abanye bayaphuma kodwa sekungcono manje
333 ngoba sekune fence abanye babe jomba ama fence makuyi period, i-discipline
334 yayibuye ishaye. I-mathematics ifuna ukuthi ube ne discipline mawusayifunda nje
335 idingeka kakhulu i-discipline ukuze uzokwazi ukuthi uyibambe mawusayifunda nje
336 impela ifuna ukuthi ube ne discipline, nokuyiyona ke into eyabashaya kakhulu
337 ngangifika ku 2018. Kodwa nje obukhali uyakwazi ukuthola u-A ngoba phela
338 wayebukhali lomfana, uyawuthola u-A obukhali ngoba isyllabus ngisuke ngiyiqedile
339 nje ngikwenze konke nje ngenze sho, ngayiqeda isyllabus ngase ngenza ama extra
340 classes ngoba vele ama extra classes iwona asebenza kakhulu ikakhulukazi ukusiza
341 lapho nalapho nalapho umbone umfundi la eshoda khona.

342 Ngoba i-period kwi mathematics iphenduka ibe i-second, iphela manje ikakhulukazi
343 mawuzofundisa izingane eziwu-40 imathematics idinga sengathi ungakwazi
344 ukunikeza i-special attention, special attention lengane, kukhona izingane ezidinga
345 ispecial attention nje vele unyaka nonyaka intengiyi notice-ile ukuthi kuhlezi kuhlezi
346 kunalezozingane uthole ukuthi asibibikho ngo 1 hour, in 1 hour uthi usahamba kuleya
347 row umangabe izingane zila ko 40 zila ko 50 izingane, ezinye ziko 80 ngizozifundisa

348 ngingedwa eklasini ngoba sisemakhaya, ufundisa ingane eziwu 80, ezinye
349 engiyfundisayo ziwu 78 ezinye 50, elinye 40, elinye 45. Mangizohamba la ngihamba
350 la ngiphethe ipeni tholukuthi ngifuna ukubabona ngithi ngisachaze 6 ngibone ukuthi
351 ay i-period iyahamba, masengifika ku 8, umuntu wesi 8 ay i-period ihambile ubone
352 ukuthi kunzima. So ingakho-ke ekugcineni utholukuthi ngigcina ngisebenzisa i-teacher
353 centred iyona egcina isisebenza kakhulu ikakhulukazi kumaklasi amakhulu ano 78 no
354 80 wezingane in one klass kuyaphoqa ukuthi ngisebenzise iteacher centred.

355 Mangifuna ukuthi learner centred sengimuphonsela ushokhi, uzohamba ayosenza,
356 noma uphose ushokhi omunye asenze omunye uzosichaza ukuthi wenzenjani,
357 ongabonike uyakwazi ukuphakamisa asho ukuthi akaboni noma akazwanga,
358 akachaze ubani akachaze nomunye, ngoba kubengathi bayezwa eklasini inkinga
359 mase kufanele bebhale ubone ukuthi nokutadisha akukho kahle, nawe wena teacher
360 awuhlezi umbona njalo ngoba phela baningi uyadoja naye usenobungane phela
361 akakuboni phela ukuthi ufundelani, akakazi ukuthi ufundelani. Sinenkinga enjalo
362 yengane la emakhaya umbuze ukuthi, esenza u-grade 11 noma u-12, “yini
363 oyifundelayo?” uthole ukuthi ngempela akazi ayi ngoba kuwukuthi uyeyisa, uthi akazi,
364 acabange isikhathi eside angazi ukuthi ufundelani, uyabona umuntu okanjalo kunzima
365 ekubeni futhi enza i-maths ngoba kufuna ube ne-vision ukuthi lento osuke uyenza
366 uyenzelani ukuze uzoyithanda ngoba ilento okufanele ukuze imaths umuntu ayibambe
367 kufanele ube nothando, uthando lwayo qha ilona olubalulekile emva kwalokho
368 kuzozenzakalela ngoba usuke unothando lwaso isibalo. Ilokho nje engibona ukuthi
369 ibuye isishaye emakhaya.

370 *On 18%, I had started teaching them in March, meaning there was still time. I felt bad,*
371 *although I was expecting that because of how I found them, I knew that a lot of work*
372 *still had to be done, a lot of hard work had awaited me. For paper 2, because we have*
373 *both paper 1 and paper 2, its geometry and algebra. Algebra as a section had its own*
374 *learning gaps, and as for geometry, they were not writing it at all, so you would find*
375 *learners drawing circles, so theorems would be written as circles. Theorems, we must*
376 *know how to state them, we must know how to prove them, so you found it was very*
377 *difficult to even begin by stating a proof. When I got here, I taught grade 12, this meant*
378 *all of grade 11 content was lost because all work is done at grade 11, so it was all of*
379 *that. It is better if I start teaching them at grade 10, even for those who are lacking, I*
380 *can catch up with them at grade 11 and grade 12. But in a case where I start teaching*

381 *in grade 12, like it was in 2018, I found there were a lot of learning gaps, even drawing*
382 *a function was very difficult then, something which is easy to do especially if you use*
383 *the table of values method, or using a calculator and inserting table values, you can*
384 *sketch it using asymptotes and then finding x and y intercepts. You found they did not*
385 *understand how they were constructing their function; it was something else which is*
386 *not correct. So you will find it becomes very difficult when they are already at grade*
387 *12, but I pushed because there were some learners, boys who were really trying to*
388 *commit themselves, because from their commitment they passed at the end of the*
389 *year.*

390 *I found some had given up on mathematics, whether they had done the work or not,*
391 *you could tell by how they were laughing in class, you could tell in 2018 that some had*
392 *gotten used to not doing any work. At times when I got to class, I would find about 13*
393 *learners in a class of over forty learners. At that time, we still had a problem of learners*
394 *bunking and leaving the school by jumping the fence when it was the maths period,*
395 *we had a problem of discipline then. Mathematics requires high level of discipline if*
396 *you're doing it, discipline is very important in maths learning, something which was*
397 *lacking in 2018 when I arrived. But for a sharp learner, they are able to get an A,*
398 *because the boy was very sharp. If a learner is sharp, they are able to get an A*
399 *because I make sure I finish the syllabus so that I can begin extra classes because*
400 *it's extra classes that help identify where a learner is lacking and helps cover those*
401 *shortfalls.*

402 *Time flies when you are teaching mathematics to a class of 40 learners, the duration*
403 *of the lesson becomes one second. Mathematics requires for each and every learner*
404 *to be given special attention, in my experience I have noticed that there are always*
405 *learners in need of special attention year after year, and an hour is never enough to*
406 *attend to those types of learners. An hour amounts to nothing when attending to 40 to*
407 *50 learners, time gets used up while you are still attending to a single row. Another*
408 *class I have has 80 learners I teach alone because we are here in a rural area, you*
409 *teach 80 learners, another class I teach has 78 learners, another has 50, the other 40,*
410 *and another has 45. If I move around the class with a red pen wishing to give*
411 *assistance to all of them, after seeing 6th learners and looking at the time I feel I need*
412 *to move, as I conclude with the 8th learner and again check the time, I find time has*

413 *run out. It is in such instances that I end up using a teacher centred approach, mostly*
414 *in class sizes of 78 and 80 learners I am forced to use a teacher centred approach.*

415 *If I want to use a learner centred approach, I pass a chalk to one of my learners for*
416 *them to solve and give an opportunity for the next learner to explain how it was done,*
417 *any learner who is still does not follow will then raise their hand and indicate where*
418 *they are lost, I then request that learner to explain to the lost learner, and can also ask*
419 *another learner to also explain. It is common for them to appear to have understood*
420 *in class, but upon assessing, you find that there is no real studying going on, because*
421 *even you as a teacher will not always see everyone because they are many and it is*
422 *easy for a learner to dodge you during class because they are still childish and are do*
423 *not know why they are studying. So we have that kind of a problem with learners here*
424 *in rural areas, already at grade 11 or 12, if you ask them “what would you like to study*
425 *towards?” You will find that they really do not know, not out of arrogance, he or she*
426 *will say they do not know, this they say after thinking for some time. So you see*
427 *teaching someone like that is difficult, more especially for a person doing maths, it is*
428 *important for them to have a vision of why they are learning, this for them to fall in love*
429 *with what they are doing, because it is when a learner loves mathematics that they will*
430 *grasp it, it is the love of mathematics that is important for all else to happen with ease.*
431 *These are the kinds of challenges we experience in rural areas.*

Participant: Mr Legend

What experiences can you share on how you were taught mathematics from when you were still at school up to your training and your journey to becoming a mathematics teacher?

432 Ngisaseskoleni, lokho sengiku diskave manje ukuthi sasikuthanda ngesikhathi
433 kusenzeka, ngiku diskave manje ukuthi ayi ngeke kwakungekho right, ngesikhathi
434 sisafunda nje esikoleni iskhathin esiningi sasifundiswa ngesiZulu, utholukuthi izinto
435 eziningi zichazwe ngesizulu, yet kodwa ama concepts aka-maths ayisingisi, so lokho
436 kusilimaze kakhulu ngoba yayithi mase iphuma mhlampe tholukuthi kuphuma
437 mhlambe iquestion, i-question izobuza ngesingisi phela, ngeke isabuza ngesiZulu
438 iquestion, so ngithe sengise collage ngoba ngifunde e-collage, kube ngcono ke e-
439 collage ngoba i-medium of instruction ebisetshenziswa bekuyi English kakhulu, but

440 ngoba besifundiswa abantu abamnyama isiZulu besingena naso isiZulu, kodwa
441 bekuyisingisi ebesingena kakhulu, kwaze kwangcono kakhuluke umuntu esese
442 collage ngoba ama concepts amaningi nje bekuyisingisi, yonkinto ebesiyenza isiZulu
443 besingena ngaleso skhashana lesa. Nokuthi i-collage ebengikuyona ibi close nakwi
444 rural area le koSikhawini, abantu abaningi ebesifunda nabo bebeziqhamukela nje
445 kuma emakhaya, kuma rural areas, so bebezama othisha ukuthi, ama lecturer, beba-
446 cater-rishe nabo bandla ukuthi sikwazi ukuthi siphase.

447 *When I was still a learner, most of the time we were taught using isiZulu and we liked*
448 *it, and this I only discovered now that it was not right. You would find that most of the*
449 *things we were taught were explained in isiZulu, yet mathematical concepts are in*
450 *English, this badly affected us because when a question came out in assessments,*
451 *they would be in English, and not in isiZulu. When I got to college, because I studied*
452 *in college, it got better in college because the medium of instruction was mostly*
453 *English, but because we were taught mostly by black people, isiZulu would also be*
454 *used, however English was used the most. Things got better in college because most*
455 *concepts were in English, although isiZulu was also used, its use was for a limited*
456 *time. Another thing is that the college I was in was close to a rural area of Esikhawini,*
457 *were most people I went to studied with were coming from rural areas, so teachers,*
458 *lecturers that is, would try to cater for those types of learners so that we would all pass.*

How many years have you been in service teaching, and what experiences can you share on how your learners interact and learn mathematics?

459 Iwu 20, iwu 20 impela.

460 Engikutholile sengilana, kuvele kwaqondana ke futhi ngoba la eNdwedwe i-rural area
461 futhi nakhona isikole engisebenza kusona, so izingane eziningi even e-primary,
462 njengoba ngise-high school mina, even e-primary ubuthi noma uzibuza izingane
463 zikutshela ukuthi iskhathi esiningi bezifundiswa ngesiZulu sona. Ngoba ubuthi noma
464 uthi ukhuluma ngesingisi kakhu wena ubone ukuthi ayi uhamba wedwa manje azisa
465 understand izingane, so immediately kodwa ufaka kakhulu isiZulu bezikhona ebezi-
466 understanda bandla ezinye kusho kona ukuthi i-maths phela akusona isfundo sanoma
467 ubani angithi uyabona. Nokuthi izingane eziningi zinayo i-mentality yokuthi, I think
468 yinto eya instil-wa kuzona mhlampe emazingeni aphansi ukuthi iMaths ibukhuni
469 iMaths, iMaths nje ngeke ize ifundwe inanoma ubani, so i-attitude towards i-maths nje

470 nakuzona izingane ayikho right bandla, ayiyinhle, bekudinga ukuthi uqale ulungise i-
471 mindset yengane, uzenze zibone ukubaluleka kwe maths.

472 Ngoba uthola ukuthi enye ize ibuze ukuthi 'awu thisha njoba ungifundisa imaths,
473 izongisiza ngani i-maths ekugcineni?' so kuyadinga ukuthi u-elaborate ukuthi
474 izokusiza ngo 1, no 2, no 3, so kube ima ibona ingane ukuthi 'ohhh, imaths kushukuthi
475 iyintebalulekile', ngoba uthola ukuthi zona bezizitshela ukuthini; imaths ingisiza
476 ngokubala kuphela angith uyabona, yet akukona ukubala kuphela ngoba even
477 nakuqala ngesikhathi soShaka babekwazi ukubala ngoba its just that babebala
478 ngamatshe ngoba babenayo imfuyo mekade ziphumile izinkomo ziye ngaphandle
479 mase zingena bekubalwa amatshe, inkomo uma ingena bekufakwa kufakwitshe,
480 inkomo umingena kufakwa itshe. Zona bezizitshela nje ukuthi i-maths it's for counting
481 kuphela, uyabona. So sazisizake for i-mindset ukuthi naka ama opportunity oba nawo
482 umangabe uno-mathematics angithi uyabona, zaqala laphoke ukuba nothando lwe
483 maths.

484 *I have 20, 20 years in service.*

485 *What I found here, coincidentally I went on to work in a school located in a rural area,*
486 *because Ndwedwe is also a rural area. So you find that even in primary school, since*
487 *I am in a high school, even in primary school if you ask learners they would tell you*
488 *that most of the time they were taught using isiZulu. In instances where as a teacher*
489 *you teach using English, you could see that they were getting left behind, they do not*
490 *understand, but immediately when switched to mostly include isiZulu, some would*
491 *begin to show they are understanding, but as you know maths is not a subject for*
492 *anyone. Another thing is that most learners do have a mentality that was instilled very*
493 *early on that maths is difficult, that maths is not a subject for any learner, so the attitude*
494 *of learners towards mathematics is not right, it is not a good one, you needed to start*
495 *by fixing the learners mindset first by making them see the importance of mathematics.*

496 *You would find a learner would even ask, 'Awu teacher, as you are teaching me maths,*
497 *how will maths help me at the end?', so you had to elaborate that it is useful for 1, 2*
498 *and 3, it is only then that the child will see that 'ohh, this means maths is something*
499 *important', because you would find that they thought maths is only used in counting,*
500 *yet it is not for counting only, because even in ancient times of Shaka (King Shaka*
501 *Zulu), people could count by using stones because they did own herds of cattle, if*

502 cows had gone out on the fields to graze, they used stones to account for each cow
503 when they returned, stones would be counted as the cow entered the kraal, with each
504 cow entering, a stone would be cast inside. So learners believed that maths was only
505 for counting, you see. So we helped expose our learners to the various opportunities
506 a person with mathematics has, it is then when they began to develop love for
507 mathematics.

In your experience with your learners in class, what creates this lack of motivation and mindset?

508 Iyahamba ne environment, lezingane iningi nazo bandla amakhaya eziphuma kowona
509 kune poverty kakhulu, uthole ukuthi ingane uyayifundisa nje yet ingane ilambile,
510 ayiyizwa nalento oyishoyo wena. Uthole ukuthi nasekhaya i-environment ekuyona
511 ingane iyatshelwa nje ukuthi 'hamba uyeskoleni kodwa layikhaya akhomuntu owake
512 waphumelela wafunda, angithi uyabona nangu ubhuti wakho ulusa izinkomo, nangu
513 usisi wakho usebenza umsebenzi ongatheni' bandla ngenxa ye background, i-
514 motivation ngisho ekhaya nje ayikho right ngenxa yokubona odade wabo mhlawumbe
515 nabafowabo abanye ephila nabo ekhaya.

516 Ingena laphoke lento yokugqugquzela ukuze ibone ukuthi iyona engaba i-solution
517 yokushintsha lesasimo sasekhaya, angithi uyabona, iyona engaba i-solution yokuthi
518 kushintsheke lesasimo sasekhaya esingasihle. But i-poverty ibalimaze kakhulu even
519 emqondweni, yet i-Department iyazamake ukuthi bandla ngo feeding scheme nayo,
520 but i-feeding scheme nayo ingane igcina ukudla eskoleni ekhaya ilala idleni? Ezinye
521 zazo zihluphekile ngempela, kunzima its not easy uku-dealer nezingane ezinjalo.

522 *It goes with their environment, you will find that most learners come from households*
523 *with a lot of poverty, you will find a learner you are teaching is hungry, they can hardly*
524 *follow on what you are teaching. You find a learners is even told at home that 'you can*
525 *go to school, but in this family there is no one who has ever made a successs of*
526 *themselves from going to school, look at your brother, he is herding cattle, and also*
527 *your sister is doing menial jobs' sadly because of their background. so there is no*
528 *motivation at home because of seeing his or her sisters or brothers, who live with them*
529 *at home.*

530 *That is when motivation becomes necessary for a learner to see themselves as a*
531 *possible solution to changing the situation at home, you know, that they can become*

532 *the solution to changing their home situation that is not good. But poverty has really*
533 *affected them, even psychologically, however the department is trying to close the gap*
534 *by programs such as feeding scheme, although feeding scheme will only serve the*
535 *learner with a meal at school, what are they to eat at home before they sleep? Some*
536 *learners are in really struggling, it is a difficult situation, it's not easy to deal with*
537 *learners who are like that.*

In your experience, how do your learners interact among themselves, and also with you?

538 Angifuni ukuqamba amanga bandla bayahlonipha, okukhombisa kona ukuthi i-
539 informal education yafakwa emakhaya, bayahlonipha nje bona baya co-operater but
540 ba-sensitive if uzokhuluma mhlampe, let me make an example, mhlambe tholukuthi
541 uthisha akhulume anganaki mhlampe ukuthi 'vele wena nje ayikho into oiyiyona,
542 ngikunikeze umsebenzi izolo, still awuwenzanga ukuhlulile' uyabona nje lamagama
543 lawa, I don't think ukhona uthisha osalisebenzisa leligama elithi ingane iyisdomu,
544 basensitive kakhulu ke mawuzokhuluma kanjalo, but mawuzokhuluma kahle nabo
545 uba encourage bayasebenza bona, bayasebenza.

546 *I do not want to lie, they are very respectful, which shows that informal education is*
547 *taught at home, so they are very respectful and cooperative. They are also very*
548 *sensitive if you say, for instance if I make an example, a teacher says without thinking,*
549 *'you are good for nothing, you still could not do the work I gave you yesterday' you*
550 *know it's those kinds of words, I do not think there is a teacher who still calls a learner*
551 *dumb, so they are very sensitive if you talk to them like that, but if you talk nicely to*
552 *them by in encouraging them they do work, they work.*

What language do your learners use the most when interacting among themselves and with you in class?

553 Hhayi akubuzwa, i-home language isiZulu, akubuzwa isiZulu, even noma ubafundisa
554 futhi ba-comfortable kakhulu esiZulwini, ayi ngoba isiNgisi bengasizwa bayasizwa
555 nesiNgisi but ba enjoyer kakhulu isiZulu ngoba amagama uwenza asondele kakhulu
556 kubona kube yinto abakwaziyo uku relater nayo, uma uzoyibeka kakhulu ngesiZulu.
557 How I wish nje nami ukube kuthiwa kuyalokhuzeka, isiZulu siya endorse'wa naso, I
558 think kungawenza umehluko lokho. Manje sekungaba inkinga ke ama-concepts

559 hlawumbe ngoba phela naba phelo no... maningi ama concepts akhona kwi maths
560 mhlawumbe amanye angeke abekeke ngesiZulu uyabona.

561 *That is obviously isiZulu which is their home language, it's obviously isiZulu. Even*
562 *when you teach them they are mostly comfortable with isiZulu, not because they do*
563 *not understand English, they do, but they enjoy using isiZulu the most because the*
564 *terms used are those that they can closely relate to their environment if it is in isiZulu,*
565 *if you teach using isiZulu. How I wish also that isiZulu was also endorsed, I think that*
566 *that would make a difference, the only challenge then would be concepts, because*
567 *there are concepts like ... there are many concepts in mathematics that might pose a*
568 *challenge expressing in isiZulu, that will not be translated in isiZulu you know.*

If you look at isiZulu as a language, where is it mostly used during the mathematics lesson?

569 Kwi-maths kusebenza lona ngqo igama lakhona ka-maths, isiZulu is for i-
570 communication uyabona, mhlawumbe leyo concept makuwukuthi awukwazi ukuthi
571 uyichaze kahle ngesiZulu wenza mhlawumbe ama examples nje ubanike ama
572 examples izinto ezizoba relevant kwi-environment abakuyona angithi uyabona
573 njengoba bela kwi-rural area, but nje kuba isiZulu nje as i-communication, but nesingisi
574 siyangena kakhulu kodwa nje isiZulu bayasi-enjoyer, kakhulu bayasithanda isiZulu,
575 kukwenza bathande nesifundo uyabona kwenza bathande nesifundo nakubake i-
576 employer ingakufuni loko ngoba i-medium of instruction Isingisi.

577 And kuyabasebenzela (ukuthanda isiZulu), kule experience yami nje ka 20 years,
578 ngibuye ngifundise no-matric, ay kubasizile bayabathola o-A through i-home language
579 yabo isiZulu, bayabathola o-A. Futhi noma umuntu engayi understand umuthi umqala
580 ngesingisi uthi ake ngi explain ngesingisi ke ngibone ukuthi inkinga yakhe kahle kahle
581 yini, ubone ukuthi hhayi akezwa kahle, but the moment nje uyishintshele esiZulwini,
582 uze wenze nama-examples, ay baya excel-a abantu, baya excel kwi experience yami
583 ngikubonile ukuthi isiZulu siyabasiza, siyabasiza isiZulu

584 *Mathematics has its own specific mathematical terms that are used, so the use of*
585 *isiZulu is for communication, say maybe you are not able to give a proper explanation*
586 *of the mathematical term in isiZulu, you do examples and give them examples using*
587 *things that will be relevant to their environment, as you can see they are in a rural*
588 *area, so it is mostly isiZulu that we use for communication although English is also*

589 *used, it is isiZulu that they enjoy using the most. They love isiZulu, and it makes them*
590 *fall in love with the subject, this dispute the fact that the employer does not like that*
591 *because the medium of instruction is English.*

592 *It works in their favour (liking isiZulu), in my 20 years of experience in which I*
593 *sometimes teach matric, it helps them as some even get A's through using their home*
594 *language isiZulu, they do achieve A's. Even for a learner who does not understand*
595 *when you are using English, if you explain to them using English trying to diagnose*
596 *the problem, you find that they do not understand, but the moment you use isiZulu,*
597 *and use examples, you will find they excel, in my experience I have witnessed isiZulu*
598 *helping them, isiZulu helps them.*

When you assess the state of learner resources for mathematics, what experiences can you share on how teaching and learning is done?

599 *Ama resources ayashoda kakhulu, angifuni ukuqamba amanga kuyabalimaza ama*
600 *resources, ngike ngize ngithi nje mawuthinta eyama calculator nje, atleast umfundi,*
601 *ngoba baphuma emakhaya a-poor bandla iningi labo majority yabo, ngiye ngize ngithi*
602 *kunokuthi ufake abazali ezindlekweni mhlawumbe bengakwazi ukukuthengela izinto*
603 *ezinjenge calculator, atleast iboleke i-calculator komunye i-maths nje ngeke ukwazi*
604 *ukuyifunda i-calculator ingekho. Njengo trigonometry, makungathiwa thola o-sine 20*
605 *uwuthola kanjani ngekhandha? Kuyaphoqa ukuthi akabe nayo i-calculator, ngiye ngithi*
606 *nje kungcono ongenayo i-calculator akayiboleke ukuze sikwazi ukuqhubeka,*
607 *bayakwazike ukubolekana bandla ukuze kuqhubekwe kufundwe, naseklasini nje*
608 *bayabolekana, baya-sherisha nje bayabolekana. Mhlawumbe aboleke kwenye igrade,*
609 *engangeni i-maths ngaleso sikhathi.*

610 *We have a shortage of resources, I do not want to lie, lack of resources negatively*
611 *affects them. I sometimes even say, if you take calculators, and taking into*
612 *consideration their poor backgrounds and not wanting to put their parents in additional*
613 *expenses they can not pay, I say atleast a learner must go and borrow from another*
614 *because they cannot learn mathematics without a calculator. Take trigonometry, if you*
615 *are required to find the value of $\sin 20$, how do you find this value without using a*
616 *calculator? It then becomes necessary for a learner to have a calculator, I usually say*
617 *to them whoever does not have a calculator must go and borrow in order for us to be*
618 *able to continue with the lesson, they are able to borrow each other in order for them*

619 *to continue learning, even in class they do borrow each other, they share and lend*
620 *each other, maybe borrow from another grade that does not have a maths lesson at*
621 *the same time.*

How do you find your learners engagement with mathematics outside the classroom?

622 Abanye, iningi labo bayayenza bandla i-home work angifuni ukuqamba amanga
623 bayayenza i-home work iningi labo, but bakhona labo abangayenzi but uma uthi
624 uyabuza ukuthi yini i-reason akutshele ukuthi akekho umuntu okwaziyo ukungisiza
625 ekhaya ngizihlalela nogogo, isikhathi esiningi banama guardian uthole ukuthi
626 njengoba bebancane nje iningi labo bandla abasenabo abazali, so akutshele ukuthi
627 ngizihlalela nogogo njengoba sikwi rural area thisha umakhelwane okhona ekhaya
628 kudinga ukuthi ngihambe ukuze ngiye kamakhelwane kumuntu ongase angisize kwi
629 maths so usizo ngigcina ngokuluthola la esikoleni, ngqo la kuphela la esikoleni, uma
630 ngingalutholanga la eskoleni ngiyazi nje ukuthi ekhaya vele akekho umuntu ofundile
631 ekhaya, nosizo engingaluthola umuntu okude loyo, uyabona engingeke ngikwazi
632 ukufika kalula kuyena.

633 *Some, most of my learners do their homework, I don't want to lie, they do their*
634 *homework, but there are those who do not do their homework and if you ask for a*
635 *reason a learner will tell you that there is no one who can help me at home I only stay*
636 *with my grandmother. In majority of the cases they stay with their guardians, you will*
637 *find that young as they are, most of them no longer even have parents, so a learner*
638 *will tell you that he or she lives with their grandmother, they will tell you that since we*
639 *are in a rural area, if I need maths help from my neighbour I need to walk a long*
640 *distance, so I end up only receiving help here at school, here at school only, and if I*
641 *do not get help here at school I know I will know I will not get it anywhere else because*
642 *no one is educated at home, and any possible help is from someone who lives very*
643 *far and I cannot easily reach that person.*

How do you normally respond to a situation of your learners' reliance on you?

644 Ngike ngizame kona loku kwama extra classes, uthole ukuthi mhlampe ngizothi ok
645 asifikeni Saturday njengoba sike sifike nangama holide futhi ngithi asizeni ngama
646 holide. So uma kuno free period futhi nami thole ukuthi ngi free, ngiyahamba ngiyoba
647 assister, ngibe ilona lolusizo abaludingayo. Mhlawumbe ikakhulukazi futhi laba
648 abanezinkinga kakhulu ebesengike ngazi mention, mhlambe ngifike ekuseni ngithi

649 asingene ngo 7 nje ekuseni, ngiqale ngi-attend bona ngo-7 kuqambe kushaye isikhathi
650 sokungena kwesikole nje nabo sebekwi level efanayo nalaba abanye, so that singeke
651 siloke sidonsela emuva ngoba phela ne annual teaching plan imile ukuthi nawu
652 umsebenzi okufanele siwukhave.

653 *I try doing extra classes, I tell them on let us come to school on Saturday, as we do*
654 *during holiday, so I say let us come during school holidays. So if there are free periods,*
655 *and I am also free, I go to assist them and become the helping guide they need. For*
656 *those with the challenges I have already mentioned, I will tell them to come earlier to*
657 *school, tell them 'let us arrive at 7 in the morning', I arrive early in the morning at 7 and*
658 *begin my day by attending to them, by the time school starts they have learned*
659 *something and are now at the same level as other learners, so that we do not keep*
660 *trailing behind because the annual teaching plan prescribes the work that must be*
661 *covered.*

How is the ATP and syllabus, are you able to cover in time?

662 Akufani, kodwa akwenzeki ngqo, ngenxa yalezinkinga esizi-mention-ayo akwenzeki
663 ngqo ngoba ku-unfair phela ukuthi uthi ufuna ukuphusha iATP ngoba nakhu uthi
664 uzama uku-impresser uyabona u-employer, kanti uhamba wedwa izingane zisele,
665 that's why kubalulekile ukuthi before wenze umsebenzi omusha wosuku, do ama
666 corrections kuqala uku-checker ukuthi lomsebenzi odlule bakuphi nawo. Ngoba
667 awukwazi ukuqala umsebenzi omusha usashoda lo odlule because i-maths iya-linker
668 uma uyibheka kahle, u-basic uyasiza laphaya phambili.

669 *It is not always possible to cover all work as outlined by the ATP because of the*
670 *reasons I have mentioned earlier, because it is also not fair to push to cover the*
671 *syllabus as outlined in the ATP while leaving learners behind, that is why it is important*
672 *to do corrections before the beginning of each day's lesson, to check whether they*
673 *have understood the previous day's work. Because you cannot begin teaching new*
674 *work without addressing the previously done work, because mathematics has links if*
675 *you study it, all basics learned earlier assist in the learning of upcoming topics.*

Are you able to attend to your learners on a one on one?

676 I won't lie to you, ay u1 on 1 awenzeki, because of i-overcrowding, ay baningi kakhulu
677 uma ungathi wenza u1 on 1 kushuthi kungagcina kungafundwanga ngaleyo period.

678 That's why sike sithi asibaqoqele ndawonye laba abanezinkinga ezinjalo,
679 sibahlanganise nje ndawonye sikwazi ukubasebenza ngaleso skhathi, ngoba u1 on 1
680 awenzeki, awenzeki u1 on 1, okwenza kube kukhuni ngisho ukufundisa ngoba uyasiza
681 phela u1 on 1 ukuze nomfundi abone ukuthi uthisha ungikhathalele nami uyabona, its
682 unlike usifundisa sonke eklasini. Abanye baze bacashe, kulula ukuthi acashe omunye
683 angaphakamisi ngisho ukuphakamisa mangabe nibaningi uyabona, igcine
684 ingafinyelelanga kahle, ay i-overcrowding iyasilimaza ngeke, isilimaza ngempela.

685 Bayasizana ke futhi noma bebodwa, ukuthi iskhathi esiningi ngiye ngenze sho ukuthi
686 angibe khona ngoba uma bebodwa uyabazi nawe abafundi ungazitshela ukuthi
687 bayasizana kanti sometimes sebezixoxela okwabo. Bayasizana because uyawabona
688 ama results ukuthi kade besizana bandla, kodwa ngiye ngenze sho ukuthi mangithola
689 ithuba ngibakhona so that uma kuwukuthi baba nenkinga abakwazi ukuyisolver
690 bebodwa ngiyakwazi ukuba khona mina ngibasize eduzane. Even ama extra classes
691 bayaba nawo nje bebodwa, basale nje bodwa, baqoqane basebenze nje bebodwa.
692 Ngoba babalekelani? leyankinga yasekhaya bandla ukuthi once umuntu wasuka
693 eskoleni, waphuma eskoleni useyoyibona i-maths the following day uma esenabanye
694 futhi.

695 *I won't lie to you, it is not possible to do one-on-one because of overcrowding, there*
696 *are too many, if you committed to doing one-on-one you would end up not teaching*
697 *on that period. That is why we usually say, let us group together those learners with*
698 *common challenges, group them together and create time to work with them, because*
699 *it is not possible to help them on a one-on-one arrangement, which makes it difficult*
700 *to teach because one-on-one does help learner to see how you as a teacher worry*
701 *about them, unlike when you are teaching them as a class, where some avoid your*
702 *attention, it is easy for a learner to hide and not raise their hand when they are many*
703 *in class, so you end up not reaching out to them. So as for overcrowding, it really does*
704 *affect our work, a lot.*

705 *Learners also help each other, although most of the times I monitor them to make sure*
706 *they are engaged with their work, because you would think that your learners are doing*
707 *some work only to find that they are talking about their own stories. They work*
708 *collaboratively and you can see when analysing results that they were helping each*
709 *other, but I make sure to also be present whenever I get a chance so that when they*

710 *encounter challenges I am close by to help them. They even hold extra classes without*
711 *a teacher, alone as learners, they organise themselves into a group and work as a*
712 *group alone. What is the reason for this? To avoid a problem of not getting assistance*
713 *once they reach home, they will only do mathematics the following day with other*
714 *learners at school.*

If you look at assessments, how does language affect them?

715 Noma engabe ufunde ngesiZulu, noma engabe ufunde ngesingisi, but iphepha uma
716 seliqhamuka ngesingisi bayakwazi ukuphendula ngoba i-maths phela its not about
717 isingisi, ama method nje asebenzayo laphaya kwi maths, uma ebambe i-method nje
718 uqedile. Its either uyifunde ngesizulu noma uyifunde ngesingisi, uma ebambe imethod
719 nje uqedile. Kodwa ukuthi bafundiswe ngesiZulu kuyabasiza kakhulu, ukukhululeka
720 ngoba kwi maths its all about i-technique, ngoba oyifeyilayo hayi ngoba eyifeyila ngoba
721 esuke engazi sibukhuni isbalo, omuye uze aphume ephepheni athi “ey thisha
722 belibukhuni iphepha” not necessarily ukuthi iphepha belibukhuni, uthola ukuthi i-
723 technique abengenayo. Ngoba ngeke phela uthi uzokwenza ama example awu-1000,
724 uthi ‘shocase njengoba ngenze ayi-1000 nje kuzophuma eyodwa ephepheni yale’ no
725 kungaphuma nje into ehlukile altogether, but if ingane nje ine-technique izokwazi
726 ukuyiphendula. Uma ine-technique nje ukuthi mangabe kuthiwa ngi-solve u-x
727 ngenzenje, noma engabe sekufakwe maphi ama variables ziphi izinamba i-technique
728 ithi mangi solve u-x ngenzenje, okubaluleke kakhulu nje i-technique.

729 *Whether a learner learns in isiZulu, or English, when he or she writes a that is written*
730 *in English, they are still able to answer questions, because maths is not about the*
731 *English language, mathematics is about the methods used to solve problems, if he or*
732 *she has a good grasp of the methods, then that is it. Whether they learn maths in*
733 *isiZulu or in English, but learning in isiZulu helps them a lot to be comfortable because*
734 *in maths it is all about the technique. Those who fail do so because they do not know*
735 *or the maths problems difficult to them, you will find a learner coming out of a maths*
736 *test saying “ey teacher the paper was difficult”, they say this not because the paper*
737 *was challenging, but you will find they did not have the technique to answer questions.*
738 *Because it is not possible to show them 1000 examples and think ‘without a doubt one*
739 *of the 1000 examples will come out as a question in the test”, a completely different*
740 *question can come out altogether, but if a learner enters the exam room with a*

741 *technique, they will be able to solve it. If a learner has a technique of how to approach*
742 *a question when required to solve for x, it will not matter which variables or numbers*
743 *are used, if the technique requires x to be solved in this response way, then that is it,*
744 *so it is the technique that is most important.*

Participant: Mr Mathonsi

Ake ungixoxele ukuthi waqeda nini isikole nokuthi esikoleni wawufunda kanjani izibalo?

Briefly share with me your schooling experiences on how you were taught mathematics?

745 Esikoleni ngiqede ngo 2001, umatric wami bengiwufunda ngalwo nyaka lowo, thinake
746 bekusekhona lento ebizwa nge corporal punishment, sishawa. Uma kuwukuthi
747 ubunikezwe umsebenzi ukuthi wenze as a classwork especially kwi maths, kufanele
748 uwenze ngempela ngoba uma ungawenzanga uzoyisutha. Bese kuzoba ne-
749 homework ngokunjalo futhi uma unikezwe i-home work kufanele wenze sho ukuthi
750 ekhaya uma ufika... thinake emakhaya ke bekunezinto ze-study eskoleni ebesifunda
751 kusona uthole ukuthi singena u-half past 5 ekuseni, siphume u half past 5 ntambama,
752 mawufika ekhaya mhlawumpe ekhaya ufika kuyoshaya uhalf past 6 sihamba
753 nangezinyawo. Uyakhumbula ke ngalesoskhathi sakuqala ukuthi bekungalinganwa
754 ngokwamandla abazali bethu, kwesinye isikhathi uthole ukuthi noma amandla ekhona
755 kuthiwe kumele uqine ube indoda makuwukuthi uwumfana. Ufike lapho ntambama
756 kufanele wenze izinto ezincane, mhlawumbe uwashela lelo shethi elilodwa futhi mase
757 ungena emsebenzini ubhala lowomsebenzi futhi, wonke ayi ngoba ukhetha uthisha
758 ngoba umsaba. Mhlampe ekufundeni kwethu ke... ehh, ya besifunda, bekufundwa
759 ngendlela okufundwa ngayo manje, kodwa le eyethu mhlawumpe uma uwumfundi
760 mawubuza kuthisha kwesinye isikhathi uthole ukuthi vele naye mhlampe impendulo
761 akanayo, awunayo leyo platform yokuthi ubuze noma uwumfundi uveze i-view noma
762 enye i-method yokuthi mhlampe lesosibalo sibe lula.

763 *I finished my matric in 2001, that was the year I was doing my matric, during our*
764 *schooling years there was what is called corporal punishment, we were beaten. If you*
765 *were given a work to do as classwork you had to make sure you do it because if you*
766 *fail do it you would get a beating. The same goes with homework, if you were given*
767 *homework to do you had to ensure that as soon as you arrived home... during my time*

768 as a learner in the rural area we had a study at school, you would find that we had to
769 be at school by half past five (05h30) in the morning, and leave school at half past five
770 (17h30) in the evening, by the time you get home it will be around half passed six
771 (18h30) in the evening walking on foot. If you recall during those times our parents
772 economic status varied, and at time even if they could make ends meet they would
773 say you must grow to be strong as a man if you were still a boy. When you would get
774 home in the afternoon you would find home duties awaiting you, maybe you would
775 start by washing that one school shirt you had, then get down to doing your school
776 work, all the school work that needed to be written, not just that of a teacher you feared.
777 Maybe in our schooling... ehh, ya we used to study, we learned in the same way
778 learning is done these days, but in our case if you asked a teacher as a learner you
779 would find that maybe they also did not know the answer, and you did not have that
780 platform to ask further question or make a contribution by suggesting a view or another
781 method that would make the solution to the maths problem easier to solve.

Ungathini endleleni yokufunda kwakho izibalo useseskoleni nasendleleni owafundiswa ngayo ukufundisa izibalo ususe college noma enyuvesi?

What experiences can you share on how you were taught mathematics while you were still at school and how you were taught to teach mathematics in college/university?

782 Angithi mhlampe ngingathi ukwenza kwethu akufani singothisha, kukhona uthisha
783 othola ukuthi usuke enothando lento ayenzayo noma ayenzisayo, futhi uyeke ubheke
784 nendlela wena ofundiswe ngayo, uma kuwukuthi ayibanga yinhle ayibanga yinhle
785 kuphi? Uma ingabanga yinhle kuwena kufanele u-improve kuphi endleleni ofundiswe
786 ngayo, beseke kube ukuthike uya improver endlelenike lokhu ongakufundiswanga
787 kahle ufisa ukuthi u-improve especially uma usuke uwu Tisha, ingane zakho uthola
788 ukuthi ingane ozifundisayo mawungu Tisha uzifundisa ngendlela yokuthi zibe i-top
789 notch.

790 Nokulandelelake i-background yomntwana, ngoba asifani, uthola ukuthi ingane
791 mhlampe iyona eyi-bread winner, noma mhlampe i-child headed, iyona mhlampe
792 ephethe iyona engumzali kodwa isafunda nayo. Uthole ukuthi kuthina kuqala ibikade
793 inganakwa leyonto, uthole ukuthi uthisha uvumbula zothi ngenduku, aka-understand
794 ukuthi lengane le iwumzali, mhlampe ilale late, iqale yageza ingane zakwabo, yavuka
795 ekuseni yayokha amanzi, yaqale yapheka iphalishi, yaphekela ingane zakwabo

796 njengoba ifika late, ifika esangweni iyashawa, ufika laphana umsebenzi ayiwenzanga
797 uyashawa.

798 So minake ngibe sengiyishintshake indlela yokufundisa ukuthi no, kufanele uthole
799 kuqala umntwana ukuthi usimo esikanjani, kunokwenzeka aka participate nje, aka
800 perform kahle eklasini kungenxa yezimo ezithile ezisuka kwi-background yakhe, i-
801 background yakhe ayiyinhle. I-grounding yakhe ayiyinhle, so izimo ezenzakalayo lezo,
802 so umntwana osuke ekanjalo akumele umthathe harsh, akumele ube harsh kuyena
803 lowomntwana. Nanokuthi futhi umntwana okanjalo kumele umfundise njengoba
804 ufundisa abantu, ubafundise bonke but yena mase eba special, before abe special,
805 ake uqale umthathe nje, ngoba phela singothisha singabazali, umthathe nje uhlale
806 naye noma e-office noma e-staff room ninobawu-2 kungekho muntu, kodwa wenze
807 sho ukuthi uwulo Tisha ongahlekisi ngengane noma ngobuze bomuntu, uthole
808 mhlawumpe ukutrhi yini inkinga yayo ikuphi inkinga ukuze ukwazi ukuthi uyi-
809 understande. Once wathola inkinga yomntwana noma yomfundi it is where uzokwazi
810 ukuthi umbuthe ngendlela eqondile, even nezinto omufundisa zona awumfundisi
811 nezinto ezingama complex problems especially kwa maths, i-maths i-broad kakhulu,
812 awumfundisi lezinto ozifundisa wonke umuntu, umfundisa lezinto owaziyo ukuthi
813 uzozibamba, kancane kancane umcathulise ngoba kunabantwana obonayo ukuthi
814 ngeke aze aphase vele lo, kodwa ngenxa yokuthi kufanele uthole igrounding yakhe,
815 izinto ezimu-surroundile, ukuthi why e-perform kabuhlungu kangaka, why e-lazy, its
816 because of mhlampe i-background ayiyinhle, umenzise izinto ezilula uzame ukuthi
817 ngeke umuntu angatholi no-30 (%)

818 *You know as teachers we do not do things the same way, you will find a teacher with*
819 *passion for what they are doing. You ought to do an assessment of how you were*
820 *taught, if you see that there were gaps in how you were taught, you must then ask*
821 *yourself what were those gaps? If there were shortfalls on how you were taught, you*
822 *then improve on those aspects in your one teaching those areas you have identified*
823 *as lacking as a teacher. If you are a teacher you must always strive for your teaching*
824 *to produce learners who are top notch.*

825 *It is necessary to understand a learner's background, because we are not the same,*
826 *you will find a learner may be a bread winner, or is the head child headed home, they*
827 *may be the parent in the home while also studying. Before, there was no awareness*

828 of such things, a teacher would just lash with a stick, not understanding that this child
829 is a parent, he or she may have slept late as they had to bath their siblings, woke up
830 in the morning and fetched water, had to cook iphapishi for younger siblings and as a
831 result is arriving late at school, at the gate they are beaten, in class the homework is
832 not done, they get a beating.

833 So I then changed how I teach, and said no; I must first find out about a learner's
834 situation, as it may very well be that their lack of participation, lack of performance in
835 class is as a result of some things in their background, their background is not good.
836 Their background is not favourable, so those kinds of things do happen, so such a
837 learner must not be treated harshly. Another thing is that such a learner must be taught
838 like you are teaching a human being, teach all of them the same, but be give special
839 attention to this learner. However, before they are special, take some time to engage
840 with the learner sitting down, just the two of you in an office or staff room with no one
841 else around, but make sure that you are not the kind of teacher who makes fun of a
842 learner or rejoice at another person's vulnerability. You find out what is the learners
843 challenge, how is their situation, do so to better understand a learner. Once you find
844 out about a child or a learner's challenge, it is when you are able to help pick the
845 learner up in a manner that is acceptable, even the kinds of things you teach this
846 learner, you do not teach them complex problems in mathematics. Maths is very
847 broad, so you do not teach this learner what you teach others, you teach them things
848 that you know they will be able to grasp, and bit by bit you walk the learner through,
849 because there are learners who are challenged to a level where you can see that they
850 will not pass, but because you must search for their background, what surrounds them,
851 the reason why they are performing so dismal, why he or she is lazy, it may very well
852 be that their background is not good, you give them basic problems for them to atleast
853 get 30(%)

Kuyenzeka yini kuvele izingqinamba eziphathelene nezinsizakusebenza eklasini uma
ufundisa abafundi?

*What experiences can you share on your learners' use of learning resources in your
mathematics classroom?*

854 Nginenkolelo yokuthi umntwana kufanele aqale, njengoba ngila e-high school,
855 kufanele aqale ka grade 8 akwazi ukusebenzisa nje nge-calculator, akwazi ukucifiza

856 i-calculator, mhlawumbe ngenze isbonelo nje; i-square root, sisebenza ngama root
857 signs, square root of 4, square root of 1, square root of... intezifana nalezo. So
858 uyamjwayeza, 'punch i-calculator' uma kuwukuthin akanayo, kungenzeka mhlampe
859 abazali banawo amandla kodwa abakabi nawo amandla okuthi bamuthengele,
860 bangakwazi ukuthi bamuthengele kodwa abakabi nayo imali yokuthi bamuthengele,
861 kunokwenzeka akanayo ngenxa yokuthi vele mhlampe uyena vele owubaba noma
862 owu-mah ekhaya ngenxa yokuthi abazali abasekho. Ukhumbule ukuthi emakhaya
863 iskhathi esiningi abantwana esibafundisayo abanabo abazali, uthola ukuthi mhlampe
864 kade badlula abazali, mhlampe ababazi kwayibona, mhlampe uzikhuliselwa ugogo,
865 mhlampe uzikhuliselwa umkhulu, mhlampe adlule umkhulu emhlabeni isale yodwa
866 ingane 'isiwumtshingo wethobane' so izinto ezifana nalezo okufanele sibuye
867 sizikhumbule ekutheni uma mhlampe ingane ingenazo izinsiza kusebenza wena
868 njengothisha kufanele uzame ukuthi mhlampe leyongane uyisiza kanjeni. Mhlawumpe
869 makuzongena eyakho i-period, ngiyalinganisa, makuzongena i-maths uyabatshela
870 bonke abantwana ukuthi nge period ye-maths ngyacela ukuthi wonke umuntu aphume
871 ayoboleka i-calculator, ngoba ufuna ukudeveloper lento ye-responsibility even those
872 obaziyo ukuthi they are poor, but ufuna uku-developer lento yokukwazi ukusebenzisa
873 i-calculator, yokukwazi ukusebenzisa ama resources, so siye siyenza kanjalo lento.
874 Mhlawumpe ke kwesinye isikhathi tholukuthi isikole, luckily esethu sine-sponsor, si-
875 sponsor-rishiwe enye yama privet companies, akwazi ukuthi aphinde akwazi
876 ukusincedisa ngama-calculators nama peni, ama exercise books, tholukuthi ezinye
877 isiphelelwe i-exercise book sekufanele uhambe uyothatha loyo 2 quire, noma loyo 1
878 quire, noma loyo 72 owafika in bulk ulethwe ileyo nkampani thizeni abazo sponsor-
879 rishela eskoleni, usuyayinikeza u 2 quire isiyaqhubeka iyabhala.

880 *I believe a learner must begin working with a calculator as early as grade 8, as I am*
881 *based in high school, a learner must know how to punch a calculator. Maybe let me*
882 *make an example; a square root operated with root signs, the quarry root of 4, square*
883 *root of 1, square root of... for such operations, a learner must get used to punch a*
884 *calculator, if he or she does not have one, it may very well be that their parents do*
885 *afford to buy a calculator but may not have the money to buy it immediately. It may be*
886 *that a learner does not have a calculator because he or she is playing a mother's role*
887 *or a father's role at home because parents have died. Remember in rural areas it is*
888 *common for our learners to have lost both parents, you find that their parents past*

889 away long time ago, a learner may be raised by their grandmother, or they raised by
890 their grandfather, and their grandfather may also pass on, leaving the child orphaned
891 and out to look out for themselves. So we must always remember such things and
892 have always of helping a learner who finds themselves in such a situation, have
893 strategies of helping such learners without learning tools as a teacher. As a strategy,
894 before the maths period, for example, you tell all your learners that before the maths
895 period they must all go out to borrow a calculator, this you do to develop their sense
896 of responsibility even for those who are poor, you want to develop their calculator
897 usage skills, an ability to use resources, so we usually do that. In some other instances
898 you may find the school, luckily in our case we have a sponsor, we are sponsored by
899 one of the private companies, which assist us at times with calculators and pens,
900 exercise books, some use up their exercise book, that is when you will go fetch a new
901 2 quire exercise book, or that 1 quire, or that 72 pages exercise book from the bulk
902 pack brought by the private company as sponsorship, you then give this learner a 2
903 quire exercise book for them to continue writing.

Kubona endleleni abafunda ngayo eklasini nosuke ubafundisa ngayo, ungathi mhlampe uye ubabone bekanjani, mhlampe nolimi abakhuluma ngalo uma befunda imaths, uye ubabone bekanjani?

What experiences can you share on how your learners interact with their learning of mathematics and the language use the most when interacting?

904 Indlela abasebenza ngayo, kuphela umuntu usuke ezisebenzela individually, kodwa
905 kunama strategies okusebenza nawokusebenzisa abantwana uma usuke unguthisha
906 ngokwe subject yakho. Imaths ayidingi ukuthi usebenze aloof, ube alone, ube wedwa,
907 imaths iyadinga ukuthi uthisha after eseyichazile into... mina-ke ngilomunto engike
908 ngithi njengoba ngifundisa imaths, if ngithe ngika grade 12, angiqali ka grade 12
909 ngokomsebenzi wami, umsebenzi wami ngizowuqala from grade 10, and if it means
910 kufanele ngiqale ka grade 9 kufanele ngiye ka grade 9. Mhlawumbe
911 ngizokulinganisela nje ngalento le this topic ka grade 12 i-Euclidean geometry, i-
912 Euclidean geometry kwesinye isikhathi uke uthi uma usula kuma congruency of
913 triangles and similarity kufanele uyiqale kwa grade 10, but makungathi abayi
914 understand, sekufanele ngiyilande kwa grade 8 ke manje, ngubuye ngize nayo
915 ngizenayo, ngiyiqede kwa 9, ngize kwa 10, ngize kwa 11, bese ngiyabafaka ke kwa

916 12, kwa 12 isuke isilulake ngoba vele sekuvele. So kuyasiphoqake, ukubuyela nje
917 embuzweni, kwesinye isikhathi kuye kusiphoqe ukuthi kufanele ufundise, vele angithi
918 basuke be-concentrate'ile abakhulumi, than masuqedile ukubafundisa ama methods,
919 different methods, than kufanele ubanikeze i-platform yokuthi babuze phela
920 ekugcineni, kufanele ufundise umfundi umnikeze i-platform yokuthi akabuze, ukuze
921 achaziseke aphume azi ngoba inhloso yethu vele kahle kahle iyi-1, ukuphasisa
922 ingane, ukususa lomuntu from known to unknown, that's inhloso yakhoke kahle kahle,
923 ukusuka from known to unknown. Than ke after usuqedile ke i-lesson yakho, teaching
924 and learning, than it is where ke mhlampe usubona ukuthi ok... uyabanikeza futhi i-
925 platform, utho ok, nasi isibalo, anibhaleni lesisbalo, kodwa uma unenkinga thinta
926 umakhelwane, isibalo awusenzi wedwa, ungasenza mhlampe mase ususekhaya,
927 kodwa nje uma usekoleni ubanika in groups uthi nisebenze in groups, than ukuze
928 nikwazi uku-share ama ideas, mhlampe ukhona omunye eceleni ozothi ay no i-answer
929 iyaphuma mangiyenza ngalendlela, uthisha mhlampe angayivezanga ebhodini,
930 uyabona, i-maths nje intekanjalo ayifani nento eyi-note.

931 *They work as individuals, but there are strategies of working with them as teacher in*
932 *your own subject. In math learning, you cannot work aloof, you cannot work alone,*
933 *after the teacher has explained a maths concept... I am the type of person who as I*
934 *teach mathematics, if I am in grade 12, I do not begin the lesson with grade 12 content,*
935 *I start my work from grade 10, and if it means I must start at grade 9, I will go back to*
936 *grade 9. For example, I will use this topic found in grade 12 called Euclidean geometry,*
937 *sometimes in Euclidean geometry you will find when dealing with congruency and*
938 *similarly in triangles you must start teaching from grade 10 content, but if they still do*
939 *not understand, you must then go back to recapping grade 8 content, then gradually I*
940 *finish it with grade 9 content, I get to grade 10, I get to grade 11, then I teach grade*
941 *12, in grade 12 it is then made easier because it is... So we are forced, to go back to*
942 *your question, at times we are forced to teach, while they concerntrate without talking,*
943 *you teach them methods, different methods, you then give them a platform for them*
944 *to ask at the end, you must teach a learner and thereafter give them a platform to ask*
945 *questions for them to have a clearer explanation and leave the classroom knowing,*
946 *because we only have one objective; to make the learner progress, to move this*
947 *person from the unknown to known, that is your main aim in fact, it is to move from*
948 *unknown to known. Then once you are done with your lesson, teaching and learning,*

949 *it is then when you can see that ok... you again give them a platform, and say ok, here*
950 *is a problem to solve, solve this problem, but if you have a challenge consult with your*
951 *neighbour, you do not solve a maths problem alone, you may work alone when you*
952 *arrive home, but while they are still within the school you give them work to do in*
953 *groups, and say work in groups, so that you can share ideas, maybe the peer next to*
954 *you will say 'I get the answer if I use this method', a method that the teacher has not*
955 *shown in the board, you see, maths is like that, it is not like notes.*

Uma bekhuluma bakhuluma ngani uma usuke ubafundisa, noma kuwena oke ubone kubasiza eklasini le maths?

What has been your experience of the language your learners use to interact the most during your mathematics lessons?

956 Uyabonake iEnglish across the curriculum is very important, i-communication kahle
957 kahle nge English ibalulekile ngoba umawusuke ufundisa you have to teach using
958 English. Especially i-subject yethu it's an English part, kahle kahle it's a mathematical
959 language esiyisebenzisa laphayana, akuzona izibalo language, izibalo language
960 kwakuyizikhathi zethu angazi noma isenziwa yini, kuthiwa 'ohh ukwenze ngala
961 kufanele ukwenze nangala' no asisakwenzi loko njengamanje sisebenzisa nje its an
962 English, and kuyabaphoqa vele ngoba even if aka-understand but uyabona, kune
963 language yakhona okufanele siyisebenzise ngoba even iphepha labo alisethwa
964 ngesiZulu, so kufanele umjwayeze ukuthi angene a-fit in kulento ye-mathematical
965 language, ayi kwi English maths language but mathematical language. ngoba phela
966 thina sino transpose la kwi maths uyabona, sino divide, laphana kwi English sino go
967 across ngale kwi equal to sign, thina sithini, siya-transpose and change of signs,
968 sisebenzisa imathematical language.

969 *You see English across the curriculum is very important, communication in English is*
970 *very important because when you teach you must teach using English. Especially our*
971 *subject is English based, in fact it is a mathematical language we use here, not izibalo*
972 *language, izibalo language was during our times, I do not know whether it is still the*
973 *case, it would be said 'what you do on this side must also be done on that side', so we*
974 *no longer do that, what we use now it is English, so they are forced to learn because*
975 *they can see even if they do not understand. There is a subject specific language used*
976 *because even in assessment their paper is not set in isiZulu, which then makes it a*

977 *necessity for them to be used to this mathematical language for them to enter the*
978 *exam room fit enough, not on English maths language but mathematical language.*
979 *Because we have terms like transpose in mathematics you know, we have divide, and*
980 *in English they use go across, over the equal to sign, and what do we say, we say*
981 *transpose and change sign, we use mathematical language.*

Kushukuthi kuyona le language yakwa maths, bayisebenzisa purely yaka maths nesiZulu noma bayisebenzisa kanjani?

In your experience, do your learners use mathematical language with English or isiZulu the most?

982 Bayajwayela, ngoba akuyona i-language enzima imaths language ngoba ayifani ne
983 English, English language, ukuthi ukhuluma wonke amagama lawa e-English,
984 aspecific amagama akhona and ayajwayeleka futhi kulula nokusebenzisa,
985 awamaningi futhi ngoba lapha sinoma-expressions, sino-equations, sibuye size kuma
986 signs sinama signs awu-4, mawungafuni ukuthi plus, minus, divide, usuyokwazi sino-
987 quotient, sino-difference, sino-sum, uyabona. Ilanguage yethu ka maths its quite
988 simple.

989 *Learners get used to using the mathematical language because it is not a difficult*
990 *language, it is unlike English, the English language where all English words are*
991 *spoken. Mathematical language terms are specific, and it is easy to get used to them*
992 *and make use of them as they are not many, to name them, we have expressions,*
993 *equations, and also have 4 signs, if you do not want to say plus, minus, divide, you*
994 *can say quotient, difference, sum, you know. Our mathematics language is quite*
995 *simple.*

Uma bekhuluma bebodwa ungathi uke ubone kanjani, bakhuluma kanjani imathematical language?

When they engage among themselves on given mathematics classwork, do they use this mathematical language?

996 Ngiye ngikustress lokho ukuthi asiyijwayele ilanguage yethu, asiyijwayele lelanguage
997 yale-subject ngoba uyothola yona kwa maths ngeke uthole eyakwa English language
998 ngeke uthole eyakwaZulu language, uyothola le language yala, 'makuthiwa factorize
999 wake wezwa kuthiwa factorize kwi English?' bathi "no" ngithi mina 'yah' factorize is a

1000 mathematical language, ngeke uzwe kuthiwa 'equal' laphana kuzothiwa 'the same' ka
1001 English, but la sithini sithi equal, so ileyo language esiyisebenzisayo thina kwa
1002 mathematics, and into engiye ngiyi stress ukuthi asiwajwayele lama gama lawa
1003 asiwajwayele nama terms lawa.

1004 *I stress that let us get used to this language of ours, let us familiarise ourselves with*
1005 *the language of this subject because you will only find it in mathematics and not the*
1006 *English language or isiZulu language, the only language you will find is the subject*
1007 *language. For instance 'if they say factorise, have you ever heard an instruction to*
1008 *factorise in English?' they respond by saying no, I then say 'yah, factorise is a*
1009 *mathematical language', you will not hear them say 'equal', rather they will say 'the*
1010 *same' in the English language, but here we say equal, so that is the language we use*
1011 *in mathematics, and what I stress the importance of is having used to these words, for*
1012 *them to familiarise themselves with these maths terms.*

Uma ubabheka uma ubanikeze umsebenzi eklasini noma ukuthi awenze emakhaya uye ubone kanjani indlela yabo bayakwazi ukuwenza umsebenzi?

What experiences can you share of your learners' level of commitment with mathematics in and outside of your classroom?

1013 It sometimes happens ukuthi uthole ukuthi umntwana uhambile wayekhaya, afike
1014 mhlampe akekho umuntu ongakwazi ukumu assist, mhlampe abantu abenze imaths...
1015 uyabazike abantu abenze imaths ababangingi, nomuntu mhlampe osaqeda uzothi
1016 weeh imaths mina ngangingayenzi ngangenza imaths lit., kodwa ke angifuni
1017 ukuqamba amanga, mhlampe kulama grade lawa, ngoba ngenzisa u9 this time, no
1018 11, bese kuba u-12. So u-9, angifuni ukuqamba amanga abangi stress, engicabanga
1019 ukuthi i-support ikhona banayo, and ezinye zezingane what I have identified is, ezinye
1020 abazali bazo la ko grade 9, even nakhona ko grade 11, abazali bazo abazali
1021 abafundile, ngiyacabanga ukuthi babuye bakwazi ukuthi bazi assist. Kuye kwenzeke
1022 kwesinye isikhathi uthole ukuthi ingane ihambile yaya ekhaya umsebenzi
1023 ayiwubhalanga so uthole ukuthi ilezozimo, kodwa ngiye ngithi mina; uma kuwukuthi
1024 uyazi ukuthi akekho umuntu ozoku assist ekhaya sala phela eskoleni, nine-study la,
1025 nine-study period, extra class ntambama, after half past 2, from 3 to half past 4, hlala
1026 nenze imisebenzi yonke eniyinikezwe othisha, ukuze ukwazi ukuthi mawufika ekhaya
1027 sekungukuthi nje usuya recap ucheck umsebenzi ebekade niwunikeziwe susyawu

1028 revise then uyabuya umsebenzi wathisha ukhona kusasa. So singasho ukuthi abanye
1029 isupport ibakhona ekhaya, abanye ayikho ngenxa yokuthi vele abadala ba blank
1030 mhlampe nge subject, mhlampe ingane ize ibuye uthole ukuthi isizobhala kwezinye
1031 ingane eskoleni. Fortunately enough angikaze futhi ngithole ukuthi kukhona ingane
1032 oyinikeze umsebenzi yabuya yazowubhala eskoleni, mhlampe ziyakwenza,
1033 mayiwubhala eskoleni mhlampe iwubhala during other teachers period, mhlampe
1034 uthole ukuthi ngesiZulu mhlampe ibhala imaths, noma ngenye any period mhlampe
1035 ibhala imaths, no angikaze ngikuthole lokho. Sesazama la eskoleni ukuthi sikunqande
1036 loko, ukuthi masinikeza umsebenzi strictly hamba uyowenza its homework, not
1037 classwork, not schoolwork, sikunikeza iclasswork ubhale, then ekhaya uyokwenza
1038 ihomework ubuya nayo ibhaliwe senze ama corrections remedial, then siyadlula.

1039 *It sometimes happens that a learner leaves for home and find that there is no one to*
1040 *who can assist them, maybe for people who did maths... this you know there are not*
1041 *many people who did maths, even those who have finished school would say 'I did not*
1042 *know mathematics I did mathematical literacy'. I however do not want to lie, in the*
1043 *following grades, as I am teaching grade 9 as well this time, with grade 11, and grade*
1044 *12, so for grade 9s I would be lying if I said they stress me, they do not, I think they do*
1045 *have support, and for some learners what I have identified is that grade 9 learners*
1046 *parents, and even some for grade 11, their parents are fairly educated, I think they are*
1047 *sometimes able to assist them . It does sometimes happen for a child to go home and*
1048 *not do their homework, such circumstances do occur, so I usually say to them 'if you*
1049 *know that there is no one to assist at home then you must remain behind at school,*
1050 *you have study sessions here, you have got a study period, extra classes in the*
1051 *afternoon, after 14h30, from 15h00 to 16h30, remain at school and do all your school*
1052 *work given by teachers, so that when you get home all that is left for you to do is recap*
1053 *and check on given work, you revise and come back the forllowing day having*
1054 *completed the work given by the teacher.'* So we can say for some that they do get
1055 support at home, some do not have support at home because maybe the elders at
1056 home are clueless about the subject, you will find a learner comes back and is assisted
1057 by others at school with writing of homework. Fortunately enough I have never
1058 experience a case of a learner who after giving work they come back to write it at
1059 school, maybe they do it, if they write their homework at school they probably do it
1060 during other teachers period. They may perhaps during isiZulu period do their maths

1061 *homework, or any other period they are you find they are doing maths, I have never*
1062 *really been made aware of such. We are strict when we give work that it's is not to be*
1063 *done in class, it is not class work, not schoolwork, we give you class work to do in*
1064 *class, then homework come back having done it for us to corrections, remedial work*
1065 *and pass on to do other things.*

Kuma assessment anikezwa abantwana, ungathini endleleni aba yiyona for abantwana?

What experiences can you share on how mathematics assessments are received by your learners?

1066 I will be straight and fair kulokho, lento ilala kuthisha, uyabona uma unguthisha
1067 kufanele ube fair, uthi uma ufundisa ingane kodwa wenze engathi ufundisa ingane
1068 yakho, ngoba vele nayo le ingane yakho, uzokhumbula ngithe inhloso ukuthi wenze
1069 njani? Ukuthi u-uplift icommunity e-poor ngani, ngokuthi ufundise lomntwana ukuze
1070 aphase ahambe ayoba yinto akwazi ukusimamisa indawo yangakubo. Even if kuthiwa
1071 ufundisa emakhaya, uma wena u-wu thisha, uzoba strict entweni yakho... especially
1072 thina esisubmit ama ATPs, iATP phela ekhulumayo kahle kahle, ufike ubuke uATP,
1073 ATP verses u-lesson plan, incwadi, uhambe uyeklasini, ufundise ingane into okuyiyona
1074 yona. Even if ingane kuyeyase deep rural area, deep rural area, but mawuyifundise
1075 ngendlela efanele ngeke ize ibe nankinga leyongane, ngeke ize ibe nankinga
1076 leyongane. Ibe proper iteaching ngendlela efanele, ngo term 1 wafundisa umsebenzi
1077 wa term 1, wawu stressa, revision, wenza irevision, sesenza ama revision yazi akufani
1078 nathi, thina sasingabizwa kuthiwe asenze irevision eykoloni, uyabona, uthisha ethi
1079 sesiqedile, mase siqedile sijabulele ukuthi seniqedile nani, mawuthanda ekhaya ukuthi
1080 uzilalele ungafundi okwakho loko akekho uthisha owezokubiza athi wozani siyafunda
1081 ngama weekend, siyalala siya cross-night ayikho leyonto yayingekho ngezikhathi
1082 zethu. So ngiye ngisho ngithi yonke into kahle kahle ilele kuthisha, ilele kuwe thisha,
1083 nanoma ngabe ufundisa yiphio i-subject kodwa ilele kuwe. Ngoba even ezakhona
1084 emadolobheni uyakwazi ukuthi uthisha uma engafundisanga into ingaphasi, kodwa
1085 lengane ine-exposed kuyo yonke into, and inama role modela la ko makhelwane,
1086 ihlulwe ingane yasemakhaya, mhlampe ngizothatha for instance ko Eastern Cape uma
1087 kuwukuthi uke ubone ukuthi kuphaswa kanjani, kodwa leziyazindawo izindawo
1088 zasemakhaya, indawo zasemakhaya kodwa kuyaphaswa, okusho ukuthi iteaching

1089 and learning isuke iproper istraight uthisha usuke esazi istory sakhe, uthisha uhlala
1090 exactly to the point and wenza sho ukuthi ulesson plan wakhe uproper, ATP iproper
1091 uqondile ufundisa the exact content nge term yayo, esuke izo assess'wa.

1092 *I will be straight and fair with you on this one, it all depends on the teacher,if you are*
1093 *a teacher you must be fair in such a way that when you teach a child you do as if that*
1094 *is your own child. Remember what I said about the main objective is for you to do*
1095 *what? To uplift the poor community by teaching this learner for them to pass and go*
1096 *on to make something of themselves and to develop their home area. Even if you are*
1097 *teaching in a rural area, you as a teacher must be strict on your work, especially for*
1098 *us who submit an ATP, it is the ATP that dictates work in actual fact, you take a look*
1099 *at your ATP, then your ATP is viewed verses lesson plan, the textbook, and then go*
1100 *to class to teach learners the correct content. Even a learner comes from a deep rural*
1101 *area, if teaching is done effectively, the learner will not encounter challenges, that child*
1102 *will not have a problem. Teaching must be done properly, teach term 1 content in term*
1103 *1, stressing it's importance, revise, do revision, we now do revisions, it is so unlike us,*
1104 *we were never called for revision while we were still at school. A teacher would say*
1105 *we are done, once we were done we would rejoice at the knowing we were done. At*
1106 *that time you could do as you wished, you could just sit at home and not study, no*
1107 *teacher would call on you to come do revision or to extra classes on weekends, no*
1108 *teacher would invite you to a cross night study, in our days at school there was no*
1109 *such thing. So I usually say everything in actual fact rests with the teacher, it is entirely*
1110 *up to the teacher, it matters not what subject you teach, all responsibility lays with the*
1111 *teacher. Even in urban areas, if the teacher has not taught an aspect effectively a*
1112 *learner will not pass, this regardless of the child being exposed to all sorts of things,*
1113 *they even have their role models as neighbours, you find a learner from rural area*
1114 *performing better than that child. Let me take this example for instance, in the Eastern*
1115 *Cape, if you have been following on how well they do despite most parts of it being*
1116 *deep rural areas, it's rural areas but learners pass, which means teaching and learning*
1117 *is done properly by a teacher who knows their story, the teacher shoots straight to the*
1118 *point, making sure that their lesson preparation is proper, the ATP is in order, teaching*
1119 *is done at the right time as outlined in the ATP during the correct term, in line with what*
1120 *is to be assessed.*

Ngokwesipiliyoni sakho ungathi yini eyenza umntwana enze kahle uma efunda izibalo?

In your experience what would you say is the major determinant of your learners' performance?

1121 Engingakusho nje ingane ukuze iperform kahle kahle, iperform kahle, nawe futhi ube
1122 impressed uwuthisha, mina ngingasho ngithi stick to the point, know your story. If
1123 istory sakho uyabona ukuthi ayi mhlampe kukhona la engilahleka khona, uyabona nje
1124 uma uwuthisha akusho ukuthi wazi yonke into. Okokuqala, akuwona wonke ama
1125 sections esiwaziyo thina siwo thisha even sifundisa, even kwayizona lezingane
1126 ziyasixaka kwamanye ama section, tholukuthi kwayona yazi kangcono kunawe
1127 uwuthisha. So ngiye ngithi mina the best way ukuze lezingane zi-perform ifundise
1128 exactly okufanele uyifundise kona, uyi assess futhi to the fullest wenze sho ukuthi
1129 awuyi assess ngengcwadi uyi assess ngama previous question papers, ukuze yazi
1130 ijwayele indlela okufanele iphendule ngayo kwi test noma kwi examination, ungayi
1131 assess ngengcwadi ngoba kwayikhona ukuyi assess ngencwadi usuke ukhombisa
1132 ukuthi kahle kahle istory sakho awusazi.

1133 Mase kuba ilentonjane, ilento yokuthi ingane nazo ilevel of thinking ayifani, since ilevel
1134 of thinking ingafani uyazazi nawe ingane ukuthi lezi zingama high flyers, lezi zi medium
1135 zi moderate, lezi ay no ziphansi kakhulu.

1136 Into okufanele uyenzeke lapho, laba obabonayo ukuthin laba baphasile, awuthi
1137 ukubaxolela kancane ubanikeze ama activities aselingana nokwe level yabo, ama high
1138 flyers, banikeze ama problema akwi level yabo ba deale nawo themselves then baze
1139 kuwena uma befuna usizo kukhona lapho bengaboni khona, kuzothi kulaba aba
1140 moderate mhlawumbe uyabona ukuthi akekho ongafundisa omunye la uthathe
1141 oyedwa kuma high flyers eze ngala lo obonayo ukuthi uhlakaniphe kakhulu uthathe
1142 oyedwa mase uthi ngicela ungi-assist-ela labantu, wena uwuthisha mase udeala
1143 nalaba abalapha ko 0 to 29, awubafundisi yonkinto, uma uwuthisha phela awufundisi
1144 yonkinto um ausu revise-isa uma usuqede isyllabus uya-strategize, uthatha nje
1145 iphepha, uwathathe amaphepha abe u-3, nenze u-question 1, thina kwa maths kulula
1146 ke, uyazi ukuthi uquestion 1 wami uyafana nowango 2010, uyafana nowango 2011,
1147 uyafana nowango 2021... strategize mawufundisa ingane ukuze iphase,
1148 ngizokulinganisela nje uquestion 1 we maths paper 1 usuke uno 24 marks uma

1149 ungenawo u-25, uyazi ukuthi ingane lapho kufanele iwubambe u-20 ngoba wonke
1150 lama questions eyokuqala up to 1.1.4 usuke ubhaleka, esize sibe complex isbalo ilesi
1151 sokugcina, siba o-3 marks futhi naso asinawo amamaki amaningi, so uma kuwukuthi
1152 u-question 1 wakho uno 24, 25 kushukuthi leyongane kahle kahle isino 20, bala i-
1153 percent lakho ngo 15, 20 lo asemtholile, strategize, question 2 number patterns uyazi
1154 ukuthi 2.1, grade 11 quadratic uyabona kulula ukuphasisa izingane, kufana nala ko
1155 grade 9, nakhona futhi ka grade 9 uya strategize, uyafundisa yonkinto, bese usuka...
1156 wenze sho ukuthi ufundisa nge ATP awufundisi ngo term 2 ufundise into yango term
1157 3, noma ufundise into ngo term 1 kanti ufundisa into yango term 4 noma ngo term 2
1158 uyayibulala leyongani, that is why phela futhi zifa izingane zalaphaya ezansi, ngoba
1159 asinaki noma othisha ezansi, strategy, nanokuthi uma ufuna ukuphasisa ingane
1160 laphaya ezansi kufanele uhambise uthisha onespiliyoni lapha ezansi.

1161 *What I can say is for a learner to perform well, for them to perform well to a level where*
1162 *you are impressed as a teacher, the teacher must stick to the point, know your story.*
1163 *If you are somewhat lacking in some aspects or get lost along the way, if you are a*
1164 *teacher it does not mean you know everything. Firstly, we are not competent in all*
1165 *sections despite teaching, even learners themselves amaze us when it comes to some*
1166 *sections, you find a learner possessing more knowledge than you the teacher. So I*
1167 *usually say the best way for learners to perform they must be taught exactly what they*
1168 *are supposed to learn, also assess a learner to the fullest, make sure you do not use*
1169 *a textbook to assess but using previous exam question papers, this be done for them*
1170 *to know and get used to the answering style in a test or examination, do not assess*
1171 *using a textbook, because textbook assessments exposes your lack of content, as if*
1172 *you do not know your story.*

1173 *Then there is this thing of learners' different levels of cognitive abilities, since the level*
1174 *of thinking is different, you know your learners who are high flyers, those who are*
1175 *medium and moderate, and those who are too low.*

1176 *What you must do in such a situation is to give those who pass a break by giving them*
1177 *activities set at their level of difficulty, for high flyers, you give them problems which*
1178 *are at their level for them to solve themselves and only consult with you as a teacher*
1179 *if they need some help when they get stuck. For those who are moderate, if you are*
1180 *unable to pick one among them to help others, you select one of the brightest learners*

1181 from the high flyers group and request them to assist his or her peers, then you as a
1182 teacher focus on those learners falling between 0 and 29, you do not teach everything,
1183 if you are a teacher you do not teach everything when you are done with the syllabus
1184 and dealing with revision, you strategise, you take a question paper, you take about 3
1185 papers, do question 1, in mathematics it is fairly easy because you know my question
1186 1 is the same as the one for 2010, similar to that of 2011, it is still the same as the one
1187 for 2021. So you strategise if you are teaching a learner for them to pass. I will make
1188 an example, question 1 maths question paper 1 always has 24 marks to 25 marks, it
1189 is at that moment where you expect a learner to score atleast 20 marks because all
1190 these questions from the first up to 1.1.4 are easy question, the more complex problem
1191 here is the last, it's usually out of 3 marks, so it does not carry a lot of marks, so if
1192 question 1 contains 24 or 25 marks, the learner already had 20 marks. Count the
1193 percentage for 15 to 20 marks that the learner has already achieved, so you strategise,
1194 moving to question 2, in number patterns, 2.1 is grade 11 quadratic, you see, it is easy
1195 to teach learners for them to pass. Similarly, with grade 9s as well you strategise, you
1196 teach everything, then make sure your teaching is aligned with your ATP, make sure
1197 you do not teach term 3 content during term 2, or teach term 4 content in term 1 or
1198 term2, this kills the child's potentials, which is the main reason learners mathematical
1199 abilities are dead in the lower grades, because we do not pay attention, even to
1200 strategy, which is why if you want learners to perform well I'm at the lower grades, a
1201 teacher with vast experience must assume responsibility.

APPENDIX B

Mr Nothile's lesson observation

INTRODUCTION

HOW IS THE LESSON INTRODUCED?

- Teacher begins lesson by leading slogan chants, learners join slogan chants (almost singing)
- Introduces topic of the lesson, linking day's lesson with previous grades measurement.
- Stresses using isiZulu 'akushintshe luthoke, kusafana' (nothing has changed, it is still the same – referring to measurement)

HOW DOES THE TEACHER INTERACT WITH THE LEARNERS?

- Walks around the class, gives hints and reminds learners on what they must find. (question)
- Uses isiZulu to interact with learners, 'ngino piece owu-half' and amplifies one learner's response to the formula to be used $A = \frac{1}{2}\pi r^2$
- From grade 10, recaps using questioning, Prism, Pyramid, Cone and a Sphere.
- Learner responses mirror textbook distinction
(Pyramids – Triangular based pyramid, a square base pyramid, rectangular base pyramid, and a perpendicular height)
- Uses questioning and explains using both isiZulu and English
- Uses questioning to establish the difference between pyramid and a prism, elicits responses from learners.
- Uses questioning to revise types of 3D shapes in English, and re-phrases question to isiZulu: 'Yini oyaziyo ngeSphere?' ... 'What do you know about a Sphere?'
Learners: 'A ball', 'A round like shape'
Teacher: 'a globe, like a globe kababuCele' (pseudo name)
(BabuCele is a geography teacher, learners response indicate their agreement with earth model being a sphere)

HOW DO LEARNERS INTERACT?

- Talks with peer, and responds to questions asked by teacher
- Use isiZulu with mathematics terms

DEVELOPMENT

CLASSROOM ACTIVITY

- Finding the total surface area
- Finding the volume
- Scale factor

Models to calculate for classwork are cone, cylinder, rondavel, pill, half-cylinder joint with rectangular prism.

METHOD/STRATEGY:

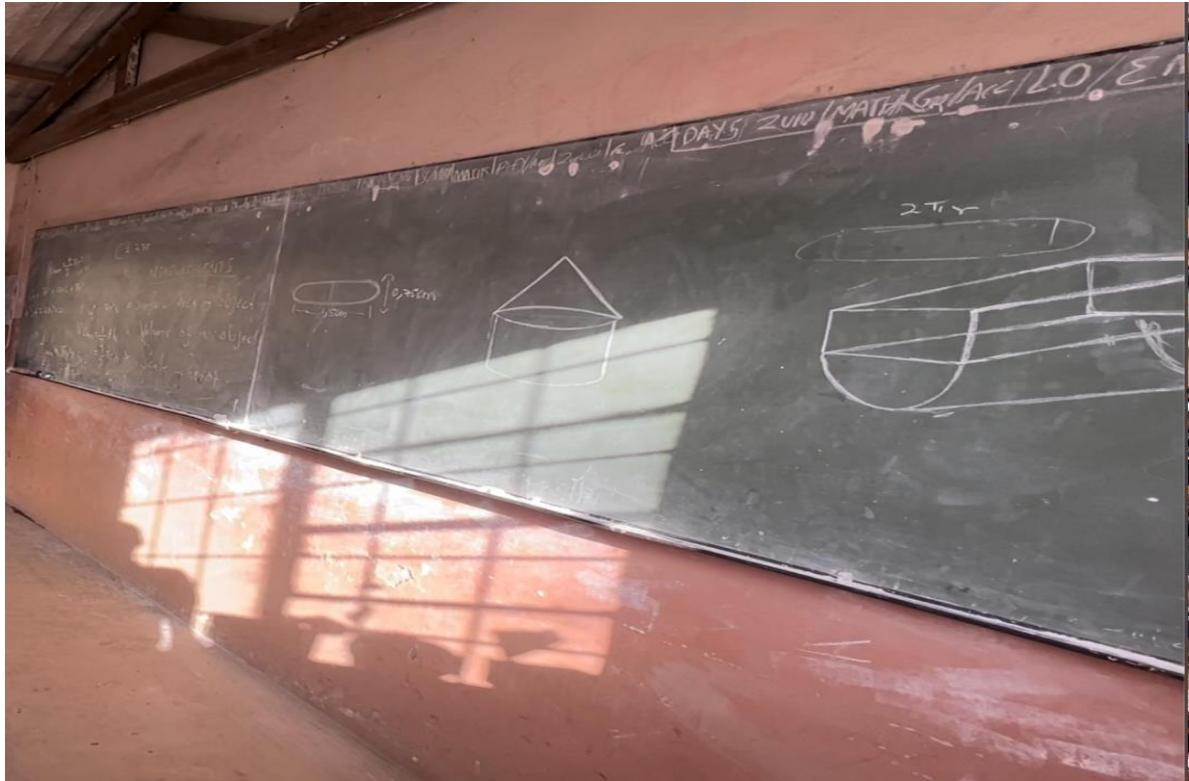
- Lists areas of focus for the Measurement: Surface area of object, Volume of an object and Scale factor
- Uses Questioning
- Facilitates discussion, led by learners' responses
- Demonstration of shapes using models (RedBull can, toilet tissue roll's inner core)
Open and close cylinder demonstration – Net diagram and formulas.
- Drawing of some model diagrams and formulas on the chalkboard ()
- Drawing of net diagrams of shapes on chalkboard
- Develops list of formulas in the chalkboard, from learner responses.

TEACHER AND LEARNER INTERACTION (LANGUAGE USE)

- I-shape ne shape kufanele ukuthi uyibukisise, 'what is a surface area?'
- Teacher: uma sikhuluma nge volume sikhuluma ngokuthi ikhontena ingafaka kangakanani... yini ethatha i-effect, u-H (when we speak of a volume, we are speaking of an amount that is contained)
- Makes use of formulas to distinguish difference between area and volume formulas of Cone and Cylinder, questions are asked in isiZulu and English interchangeably.
- Formulas are given as per textbook definition, isiZulu used to explain, mathematical terms and concepts used as written on textbook.
- Teacher uses familiar examples to demonstrate shapes of models. A pill demonstration is done using the tissue rolls inner core, 'sekushoda into engathi isivalo se roll-on ngapha nangapha' (you just need a roll-on lid covering both sides - of the cylinder)

- Model of Rondavel. 'Mhlengi has a rondavel' (as the teacher points to the model drawing of a Rondavel)

Reference to rondavel is made using learners' knowledge of the structure, how the structure composes of 2 shapes, namely; a cone and a cylinder.



Use of the rondavel model and its central pole (anchor) to match radius and aid learners in substituting correctly.

Teacher: volume of a rondavel = volume of cone + volume of cylinder

- Calculator usage by learners to share answer as it appears on the calculator, emphasis is placed on units (squared² or cubed³)
- Teacher: What is a scale factor? Okushukuthi lento izophindaphindeka kangaki? Uma kuthiwa increase by a scale factor of 3, okushukuthi a volume of the rondavel must be enlarged by the factor of k^2 okushukuthi ifactor yethu ubani, u 3, so uK umele bani u3, so sizothi 3^2 mase kuphuma bani u9. Okushukuthi uK^2 becomes a what, a formula, imibuzoke leyo ozoyibhasobha kwi exam.

- Pointing at a diagram with dimensions, teacher points at each of the dimensions and asks, 'umele ini lo?' (what is this dimension?) learners respond by either radius, height, diameter and length.
- Teacher makes emphasis on dissecting multiple joint models into separate recognisable models with formulas.

RESOURCES USED IN CLASS

- RedBull can as model for cylinder for a closed cylinder



- Tissue roll's inner core for cylinder open on both ends



- Ice cream container for rectangular prism model

CONCLUSION:

Teacher summarises the lesson by raising cylinder model (RedBull can) and a rectangular prism model (Ice cream container)

Highlights aspects of lesson critical for further practice, reminding learners on examinable aspects.

SUMMARY OF OBSERVATION:

Lesson introduction slogan chanting:

Teacher: Now who is the judge?

Learners: The judge is God!

Teacher: Who is the judge?

Learners: The judge is God!

Teacher: Why God?

Learners: Because God decides who wins or loses and not my opponent.

Teacher: Who is your opponent?

Learners: He doesn't exist

Teacher: Why he doesn't exist?

Learners: Because he disagrees to the truth that I speak.

Teacher: Speak the truth!

Learners: Speak the truth!

Teacher: Do the truth!

Learners: Do the truth!

Teacher: Speak the truth!

Learners: Speak the truuuuth!

Teacher: Do the truth!

Learners: Do the truth!

Teacher: Aw, Speak the truuuth!

Learners: Speak the truuuuth!

Teacher: Do the truth!

Learners: Do the truth!

The classroom seating arrangement is exam room setup. The number of learners is more than 60 in a relatively small classroom, with some double desks occupied by 3 learners. Few learners were without calculators, and some were sharing textbooks.

The language used in class by learners when engaging among themselves is isiZulu, the teacher uses both isiZulu and English to teach measurement.

Quite notable was the use of textbook terms and definitions during classroom interaction with teacher. A style used by the teacher in class.

An emphasis is placed on identifying models and shapes, with their respective formulas.

All learners are expected to punch on their calculators when finding a solution to a given problem. Learners give their answered in isiZulu with mathematical language and terms. During the lesson, examinable problems are stressed by the teacher, highlighting misconceptions and simplifying in isiZulu.

Mr Mathonsi's Lesson Observation

INTRODUCTION

HOW IS THE LESSON INTRODUCED?

The teacher introduces the lesson by facilitating corrections formulation for homework given the previous day on the chalk board.

Allowing learners to lead the process, he then uses questioning to establish learners' knowledge of shapes and their respective formulas.

He does an example using a rectangular prism, using a net diagram drawing on the chalkboard, and a chalk box to demonstrate how dimensions are found.

HOW DOES THE TEACHER INTERACT WITH THE LEARNERS?

Teacher code-switches (English and isiZulu) to explain how formulas are derived from shapes.

Interaction preserves mathematics terms, use of both isiZulu and English communication language states mathematical terms as they appear in the textbook.

HOW DO LEARNERS INTERACT?

Interaction among learners is in isiZulu language, but mathematical terms and concepts are expressed as they would appear in the textbook.

One learner's comment on another's solution: Faka u-metre squared ngoba i-area le, ungayishiyi injalo, khumbula wathi u-sir makuyi area kuba u-metre squared.

(leave answer in meter squared because it the area, do not leave your answer without units, if it is the area we use meter square)

DEVELOPMENT

CLASSROOM ACTIVITY

Teacher gives textbook activity to learners.

Classroom activity requires learners to find:

- The total surface area of 3D models, shown alongside questions.
- The volume of 3D shapes.

METHOD/STRATEGY:

Teacher writes example on the chalkboard:

- Refers to diagram on the chalkboard as he explains and uses questioning to elicit learners' responses.
- Uses demonstrations, models, net diagrams.

Teacher uses a net diagram to show how formula for total surface area is developed from drawing and using a chalk box to demonstrate.

Provides a step-by-step explanation

Asks learners to identify formula needed for solving the problem

Teacher gives textbook activity, instructs learners to work in pairs, 'sebenza nomngani wakho!'

Emphasis is placed on identification of formulas by learners against their relevant shape.

Learner presents solution on the chalkboard, writes while looking at their exercise book without talking. Teacher says 'shono phela ukuthi usenze kanjani, chazela iklasi.' (*explain to the whole class how you have arrived at your solution*)

Learner explains steps undertaken, using isiZulu to communicate mathematics. References made while explaining and pointing on specific steps; 'ngiqale nge-formula, mase ngiyitholile, ngase ngibheka i-shape esiyinikeziwe ukuthi athini ama dimensions ayo, so mase ngafakake kwi formula ye-volume ngoba kuthiwa asi-calculate i-volume, ya sir!' (*I*

started with the formula, upon identifying the formula, I then checked the dimensions of the given shape, and inserted them onto the formula for volume as we are expected to calculate for volume, ya sir!)

TEACHER AND LEARNER INTERACTION (LANGUAGE USE)

Teacher: What are the dimensions of this box? (as he points to the diagram drawing on the chalk board) and code switches to isiZulu; *athini ama dimensions aleli bhokisi?*

Learner: The length is 2, the other side is 4, and the height iwu (*is*) 3.

Teacher: So if the length is 2 metres, the and the height of is 3 metres, what do we call the 'other side' which is 4? (pointing at another learner whose hand is raised)

Learner: The breadth sir!

Teacher: OK... we can use breadth, but it's actually the width, because this is now a 3D shape, we use breadth kuma 2D shapes, right.

Learners: Yes!

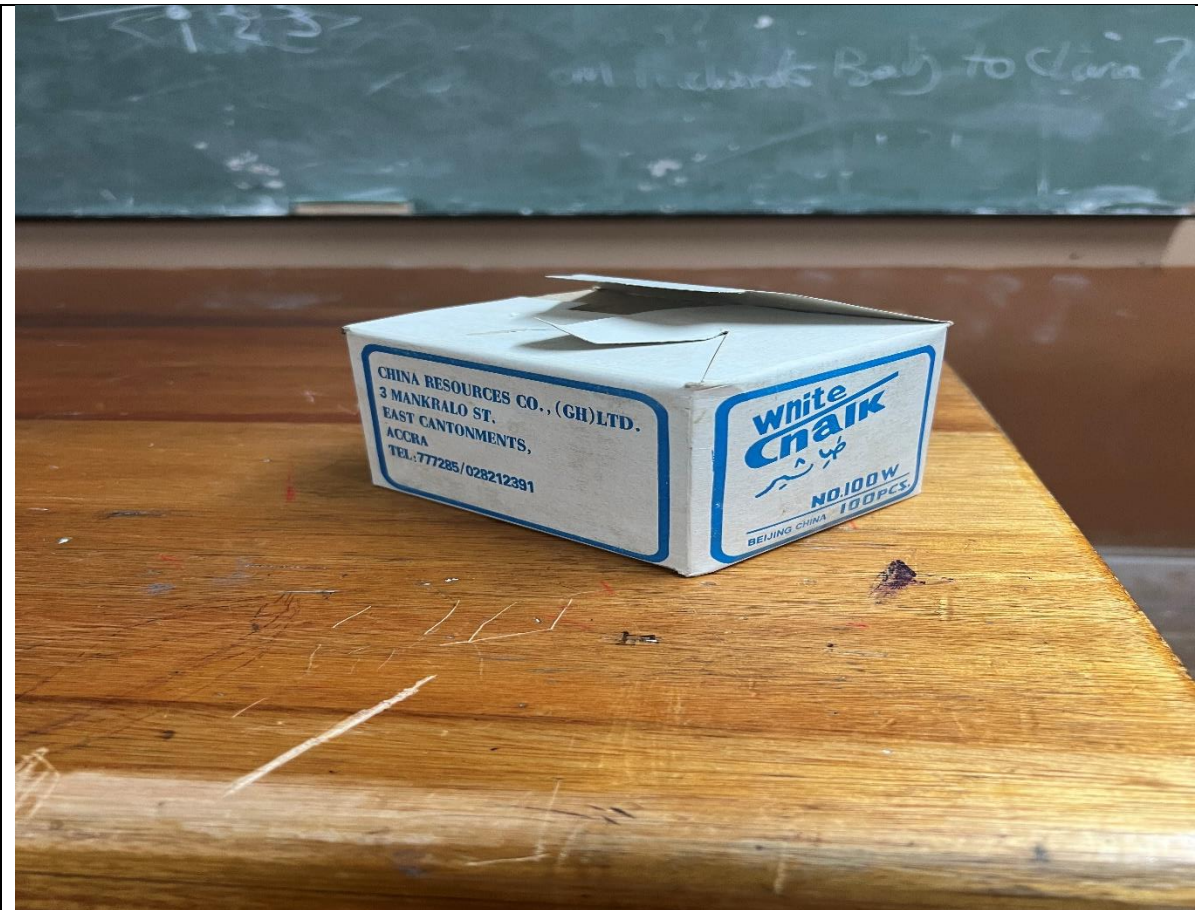
RESOURCES USED IN CLASS

Calculators

Cylindrical dirt bin



Chalk box



CONCLUSION:

Teacher concludes the lesson by summarizing area and volume, including their units. Highlights the importance of knowing formulas off by heart.

Elicits learners' responses as he points at the chalkboard the different shapes drawn, and corresponding formulas.

Requests learners to answer more questions for homework, reminds them of the study in the afternoon.

SUMMARY OF OBSERVATION:

Teacher mostly uses English, with some isiZulu inbetween to highlight or encourage participation if his learners are not responsive.

Learners use English to answer questions during class discussions, however, use isiZulu but maintain mathematical terms called as they are taught by the teacher.

Teacher mostly uses chalkboard to demonstrate shapes and their net diagrams, dimensions of shapes and elicits learners' responses by using hand gestures and code switching to simplify question or explanation.

He opens and closes the cylindrical dirt bin to demonstrate an open and closed cylinder as he explains differences in total surface area formulas.

Makes use of learners' knowledge of things like Jojo tanks (to demonstrate cylinder), classroom design ne-khonteni estolo (container tuckshop), to show larger cuboid and rectangular prism.

Rondavel roof for larger cone, one learner shouts; 'ikhoni (cone) la ice cream' (ice cream cone)

Learners rarely talked to each other during the lesson, the teacher enforces discipline and order, only engagement that happens is when a learner raises their hand signaling attention.

Learners have calculators and are actively using them during the lesson, with about 3 out of 32 learners without their own calculators.

The sitting arrangement resembles an exam setup, with double desks occupied by 2 learners per desk.

Mr Legend's lesson observation schedule

INTRODUCTION

HOW IS THE LESSON INTRODUCED?

Lesson introduced by announcing the topic of the lesson

Measurement section to focus on Cylinder and a Box

HOW DOES THE TEACHER INTERACT WITH THE LEARNERS?

Uses questioning,

Teacher: Sathi yini iVolume kombe? (what did we say is the volume?)

Teacher: i-can ewu 350ml, can I take any liquid ewu 20l ngiwufake kule can?

Learners: No,

Teacher: ngoba i-volume yakhona injani?

Learners: i-volume yakhona incane.

HOW DO LEARNERS INTERACT?

Learners interact using isiZulu and mathematics terms, taking turns, learners contribute to lesson by responding to teachers questioning.

DEVELOPMENT

CLASSROOM ACTIVITY

1. Given a cylinder, determine the following:

I. Total Surface Area

$$TSA = 2\pi r^2 + 2\pi r h$$

II. Volume

$$V = \pi r^2 h$$

2. Suppose you are given a cylinder with a volume of 400cm^3 and a radius of 5cm, determine the height of the cylinder.

Teacher cautions learners to make sure their calculator is set to the correct mode.

METHOD/STRATEGY:

Questioning

Explanation

Discussion

- Demonstration

Uses a chalkboard duster to demonstrate faces of a box, includes all dimensions, and a how formula is derived from the shape.

Teacher: Please remind me ukuthi ithini i-total surface area ye-box? (Please remind me what is the total surface area of a box?)

TEACHER AND LEARNER INTERACTION (LANGUAGE USE):

Teacher: Asibukeni unamba 1, ithini i-surface area ye-box? (Let us look at number 1, what is the surface area of a box?)

Learners: Area= $2lxb + 2bxh + 2lxh$

Teacher: What is the total surface area of the box? Ithini i-total surface area?

Teacher: ithini kombe ama units esibhala ngawo kwi area?

Learners: centimeter cube

Teacher: kshode kancane nje, uCube okabani?

Learners: Owe Volume

Teacher: Yes, which means i-Area sithi eyani?

Learners: eyeArea.

Teacher: Correct!

RESOURCES USED IN CLASS

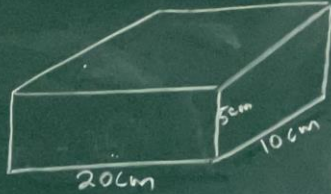
Chalkboard duster to demonstrate rectangular prism



Chalkboard drawings of box and cylinder with dimensions

Examples

Given: - Box



Find the ff:-

T.S.A

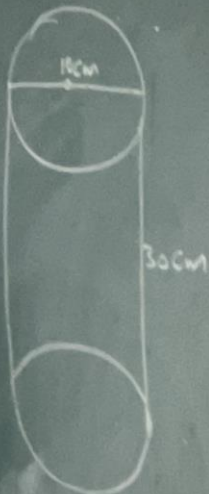
Volume

$$\begin{aligned} \text{i) T.S.A} &= 2lb + 2lh + 2bh \\ &= 2 \times 20\text{cm} \times 10\text{cm} + 2 \times 20\text{cm} \times 5\text{cm} + 2 \times 10\text{cm} \times 5\text{cm} \\ &= 400\text{cm}^2 + 200\text{cm}^2 + 100\text{cm}^2 \\ &= \underline{700\text{cm}^2} \end{aligned}$$

$$\begin{aligned} \text{ii) } V &= l \times b \times h \\ V &= 20\text{cm} \times 10\text{cm} \times 5\text{cm} \\ V &= \end{aligned}$$

Measurements

② Given: Cylinder



① Box

$$* \text{T.S.A} = 2lb + 2lh + 2bh$$

$$* V = l \times b \times h$$

② Cylinder

$$* \text{T.S.A} = 2\pi r^2 + 2\pi r h$$

$$* V = \pi r^2 h$$

CONCLUSION:

Teacher concludes the lesson by using questioning to elicit responses from learners on core aspect of the lesson, i.e. properties of a rectangular prism (language used: for box is 'ibhokisi')

Teacher places emphasis on learners knowing formulas and being able to apply them correctly.

SUMMARY OF OBSERVATION:

Mr Legend introduced the lesson by stating the topic for the day's lesson as Measurement, and named a box and a cylinder as the focus of the lesson.

He then begins by demonstrating a box shape using a chalkboard duster, asking his learners for the dimensions labelling, which his learners respond by saying: length, breadth, and height, respectively as he points at the different dimensions of the duster. The language used throughout the introductory part of the lesson is isiZulu, with mathematical terms and concepts used as they are commonly used in maths.

No translation of the terms is done, except for 'icele' translation for *side*. Also, Rectangular prism is used less often, with 'ibhokisi' (box) used more frequently.