EXPERIENCES OF PRIMARY SCHOOL TEACHERS IN TEACHING MATHEMATICS AND PROVISION OF INTERVENTION STRATEGIES TO DIVERSE LEARNERS(A CASE OF JOHANNESBURG SOUTH DISTRICT)

by

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DECLARATION

I declare that, **Experiences of primary school teachers in teaching mathematics and provision of intervention strategies to diverse learners(A case of Johannesburg South District)** is my own work and all the resources that I have quoted have been indicated and acknowledged by complete references.

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Promise Gora Date

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DEDICATIONS

I am dedicating this dissertation to:

- To my late father, for always believed in me and my mother for her endless prayers for me during the research study.

- To my siblings, for their support and unconditional love.

ABSTRACT

After attaining democracy in 1994, inclusive education was introduced to address learners' individual needs in all subjects including mathematics. However, mathematics performance in South African primary schools is poor. This trend of low mathematics pass rate continues to high school.

The aim of this study was to explore teachers' perceptions and experiences when teaching mathematics on how mathematics is taught, intervention strategies provided, teacher competence and support needed by teachers.

Eleven teachers from three primary schools in Johannesburg South District participated in the research study. Six foundation phase teachers and five intermediate and senior phase teachers were interviewed. The collected data revealed various factors that impacted on mathematics teaching and intervention provision.

The findings concurred with literature on previous research studies in that teacher incompetence, negative attitudes, overcrowded classrooms and inadequate support in state schools are the major factors that result in mediocre mathematics performance by learners. The findings suggest that unless these factors are attended to as a matter of urgency by the relevant authorities, mathematics performance in schools will remain poor'. Policies on teacher training should promote production of competent mathematics teachers and employment of mathematics educators who majored in the subject. Further, professional development should be intensified and be readily available.

KEY WORDS

curriculum, differentiation, diversity, inclusive education, instruction, intervention strategies, learning difficulty, learning environment, mathematics, teaching support

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ACRONYMS AND ABBREVIATIONS

ATP	Annual Teaching Plans
CAPS	Curriculum Assessment Policy Statement
CIP	Classification of Instruction Programs
CTE	Career and Technical Education
DBE	Department of Basic Education
DBST	District Based Support Team
DOE	Department of Education
ETS	Education Testing Services
GDE	Gauteng Department of Education
HOD	Heads of department
LSEN	Learners with Special Educational Needs
LSTM	Learning and Teaching Support Materials
ME	Master of Education
MED	Master's in Education Degree
NOTE	National Observational Teaching Examination
SA	South Africa
SABC	South African Broadcasting Corporation
SBST	School Based Support Team
UNISA	University of South Africa
WCCES	World Congress of Comparative Education Societies
ZPD	Zone of Proximal Development

CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION AND BACKGROUND

Mathematics is an important subject in the school curriculum globally. It is, therefore, imperative that all learners receive and practise mathematics at school. In addition, there is a need for teachers to provide intensive instruction and intervention to those learners who experience mathematics difficulties (Hott& Isbell, 2014). Furthermore, Bruce (2016), declared that all children can be afforded opportunities of attaining high quality mathematics instruction and experiences early in life. However, teaching and learning mediation of mathematics in a diverse classroom is a challenge to both teachers and learners. Lack of teachers' pedagogy knowledge, attitude and beliefs towards mathematics, the historical segregated educational practices pre-1994, large classes, poor learning environments and lack of involvement by all stakeholders has led to primary schools learners underachieving in mathematics.

At present, primary school learners in South Africa are not performing according to required mathematics standards. Roberts (2017) stated that there is an outcry in South Africa over low performance in mathematics in schools. Further, Pausigere (2014) describes the state of mathematics education in South Africa as being in a crisis. The situation calls for inclusive mathematics intervention strategies (Centre for Development Enterprise, 2013). South African school mathematics performance is not impressive when compared to other countries. According to Roberts, (2017:19), Trends in International Mathematics and Science Study in 2003, showed South Africa's mathematics performance as being very low. He further revealed that historically "white schools" performed closer to international standards compared to historically black schools. This imbalance is attributed to the highly unequal education of the past where black children were not afforded the opportunity to learn mathematics.

With this past historical injustice in mind, and amid other challenges, this study seeks to explore and establish teachers' perceptions, experiences and views encountered when teaching and providing inclusive mathematics intervention strategies to learners with diverse learning needs.

1.2 STATEMENT OF THE PROBLEM

Perceptions and views of teachers who teach mathematics are vital in establishing the causes of poor performance in mathematics. As stated above, the low mathematics pass rate is a concern in South Africa. Assumptions have been made by various writers and scholars about the possible causes of this low performance rate, the major one being the injustices of what happened before 1994 where unequal and segregated education was provided. Roberts (2017) argued that before democracy, most black African children were denied the opportunity to practise mathematics. Instead, African children were to be "hewers of wood and drawers of water" This has affected who is capable of effectively teaching mathematics.

The introduction of inclusive education was meant to redress the injustices of the past and provide a way forward that will enable the effective teaching of all subjects including mathematics. However, mathematics still needs considerable attention. Therefore, there was need for further research to establish the causes of this low performance in mathematics.

1.3 AIMS OF STUDY

This study aimed to explore and establish the teachers' views and experiences when providing mathematics support to learners who experience barriers in this subject. The Constitution of the Republic of South Africa(RSA, 1996), the Education White Paper 6 (Department of Education [DoE], 2001), the National Strategy for Screening, Identification, Assessment and Support (SIAS) (Department of Basic Education [DBE], 2014a) and the South African Schools Act (DoE, 1996) advocate and promote the inclusion of learners who experience barriers to learning including mathematics difficulties. Furthermore, these policies stipulate that each individual learner`s needs should be accommodated. There is a great need for inclusive mathematics intervention strategies to be provided to both teachers and learners who require it. Therefore, it was imperative that in this study, an investigation be carried out to explore teachers' views and experiences when providing mathematics support.

1.4 STUDY OBJECTIVES

- To understand teachers‘ perceptions regarding mathematics support.
- To investigate mathematics intervention strategies that will address the impact of the mathematics learning barrier.
- To explore elements that hinder the successful implementation of mathematics learning support strategies.

1.5 RESEARCH QUESTIONS

A research question is a reformation of the statement purpose so that it forms a question. There is one main research question for this study and three sub-questions.

1.5.1 Main Research Question

What are teachers ‘experiences when teaching mathematics in primary school?

1.5.2 Sub-Questions

- What are teachers’ perceptions and experiences regarding mathematics teaching and learning?
- How can teachers be empowered to provide and administer appropriate mathematics intervention strategies?
- Do teachers possess requisite skills, knowledge and experience to mediate mathematics?

1.6 LITERATURE REVIEW

A literature review assists in the reader understanding the research problem being studied so as to make informed decisions about a problem. Furthermore, a literature review is defined as a way of relating previous research and theory to the problem under study (McMillan &Schumacher, 2010).In the study, the literature review examined the following: benefits of learning mathematics, challenges encountered in teaching and learning mathematics and intervention strategies to support learners who experience barriers to mathematics learning.

1.6.1 What is Mathematics?

Mathematics is a school subject that that concerns itself with the logic of numbers, shapes, quantity and relationships. Landsburg et al. (2016) describe mathematics as a way of arranging, communicating and manipulating information using mathematical language. In addition, the Department of Basic Education (DBE, 2011), described mathematics as a language that uses symbols and notations to describe relationships of numbers. Simply put by Naude and Meier (2014), mathematics uses numbers to help us organise our everyday lives. From the literature cited above, mathematics seems to be valuable and interesting subject yet learners' performance suggests that it is a complicated phenomenon.

1.6.2 The Benefits of Learning Mathematics

Mathematics is part of our everyday life. It is used by everyone every day. Therefore, mathematics is important and beneficial. Nautiyal (2012), described mathematics as a subject that is applied in every field and profession. Meanwhile, the Times of India (2015) listed the following as the benefits of mathematics: it provides the power of reasoning, critical and logical thinking; provides access to well-paid jobs; and assists in problem-solving and effective communication. Moreover, Nautiyal (2012)argued that mathematics is used for advancement of technology. Likewise, Busiri (2012) stated that mathematics is essential for technological progression and innovation which assists in careers and economic growth.

1.6.3 How Learners Learn in General

Learners learn by observing, listening, experimenting, exploring and asking questions. The constructivist view of learning believes that learners construct their own knowledge. Landsburg et al, (2016) discussed the work of two prominent constructivists, Piaget and Vygotsky. Piaget believed a learner creates his own knowledge through assimilation and accommodation (Naude& Meier, 2014). While Piaget concentrated on individuals, Vygotsky focused on the social aspects of learning (Naude &Meier, 2014). Vygotsky assumed that learning takes place on three levels namely social interaction and interaction with more knowledgeable others (MKOs), which leads to the Zone of Proximal

Development (ZPD). Learners have to interact with others, the MKOs and then construct their own knowledge. This occurs in the learning of all subjects including mathematics.

1.6.4 How Learners Learn Mathematics.

Effective learning of mathematics occurs when the curious nature of learners leads them to test their mathematical ideas in real life (Landsburg et al., 2016; Naude& Meier, 2014). Learners' mathematics activities should be interesting and be applicable in real life. According to Piaget, (in Naude &Meier, 2014), there are three types of knowledge: physical knowledge (manipulation of objects),social knowledge (learning from others) and conceptual knowledge (own constructed knowledge). Each type is essential in learning of mathematics effectively (Naude & Meier, 2014). To learn mathematics successfully, both Landsburg et al (2016 and Naude and Meier (2014), explained the importance of learners being proficient in the five strands of mathematical proficiency namely: conceptual understanding, procedural fluency, strategic competence, adaptive reasoning and productive disposition.

1.6.5 Importance of Developing Basic and Advanced Mathematics Skills in Learners

Basic mathematics provides knowledge and skills that are encountered in our everyday lives while advanced mathematics is usually taught as a subject or as a cornerstone in the studies of other scientific disciplines, including engineering of all kinds. (Bayaga, Mtose& Quan-Baffour, 2010; Ketamo & Alajaaski, 2008; Sibbald & Griffith, 2016). Moreover, basic mathematical skills are needed in all our daily activities. Wile (2017) stated that mathematics teaches life skills.

Basic mathematics skills are necessary are required to advance to more demanding mathematics that are encountered in high school, colleges and universities. Furthermore, Zwaagstra (2014) and Wile (2017) alluded to the fact that many entry-level jobs unrelated to mathematics require basic mathematical computations. It is, therefore, imperative that learners while still at primary level are afforded the opportunity to acquire the basic mathematics skills which will enable them to participate productively in their adulthood (Toumasis, 1997 cited in Ketamo &Alajaaski, 2008).

Morvan (2016) concluded that advanced mathematics skills, without a doubt, have been a means to develop technology. Furthermore, Bayaga and Mtose (2010); Ketamo and Alajaaski (2008) and Zwaagstra (2014), declare that advanced mathematics skills plays an integral role in engineering, medical, scientific, and economic endeavours. In addition, advanced mathematical skills develops reasoning, rigour and acquisition and appreciation of the skill of accuracy. However, these skills have been replaced by the advent of technological gadgets such as calculators.

1.6.6 Challenges of Implementing Mathematics Intervention Strategies

1.6.6.1 Attitudes and beliefs

Teachers, learners, parents and peers' attitudes and beliefs play a major role in learning and teaching of mathematics. Attitude reflects one's emotions or behaviour. Haladyna et al. (1983 cited in Mkhize and Maistry, 2017) described attitude as a learned tendency by a person to react positively or negatively to a situation, idea, object or another person.

Teachers' influence on learners' learning of mathematics is of paramount importance. Domino (2009) and Farooq (2008)stated that mathematics teachers' behaviour has a huge impact on whether learners like or dislike mathematics. In addition, Mata, Monteiro and Peixoto (2012), concluded that, in classrooms where teachers are seen as supportive, students feel in control and confident of their abilities to succeed in mathematics.

Parents and peers are equally important in the learners' acquisition of mathematics skills and knowledge. Sani and Kumari (2017) and Wainwright (2011) discussed the effects of parental attitudes, beliefs and involvement in the learning of mathematics and noted that children's attitude towards mathematics is affected by parents. The more parents are involved, the more learners succeed. Of equal importance, are peer attitudes towards mathematics learning. Austin (2008) stated that research found that peers who are knowledgeable and skilled in mathematics assist their peers gain the use of mathematical language and self-confidence.

1.6.6.2 Teacher competence

As teachers, we need to be competent and know our subject matter. However, that is not the case with regard to the teaching of mathematics. Knievel, Lindmeier and Heinze (2015: 310) stated that “Teachers’ subject-specific cognition is seen as an important factor for the quality of instruction”. Mkhize and Maistry (2017), echoed the same sentiments in highlighting that university lecturers around the world cite lack of adequate mathematical knowledge and computational skills amongst students. This means these students. Furthermore, Pournara, Hodgen, Adler and Pillay (2015), claimed that in South Africa, teachers’ mathematical knowledge is generally poor and that there are instances where it has been shown that teachers seem to struggle with mathematics concepts that need to be taught to their learners.

1.6.6.3 Learning environment

A learning environment is a place where learning processes such as social, psychological and pedagogical has a positive influence on the learners’ achievements and behaviours (Adnan, Putech, Abdullah, Ahmed& Maat, 2014). In addition, Salina (2009) cited in Adnan et al. 2014), described a learning environment as a school’s atmosphere which is orderly, calm and harmonious. For the learning environment to be conducive to mathematical learning, the physical aspects available, curriculum flexible, teaching strategies varied to suit the different learning styles, teachers competence and attitudes need to be appropriate.

In South Africa and many countries in Africa, there is overcrowding in classrooms, teacher incompetence, lack of adequate mathematics support to learners by teachers, parents and peers, and an inflexible curriculum, making it a mammoth task to create a conducive and effective learning environment.

1.6.6.4 Lack of parental and other key role players’ support

In many African countries including South Africa, most parents were affected by the political history of their education where mathematics was not seen as a necessity for black people (Roberts, 2017). As a result, these parents do not possess the will to assist their children in mathematics be it in terms of motivation or pedagogy. If parents view and

consider mathematics as a valuable subject, learners will be influenced in being diligent in their learning of mathematics (Sani, 2015).

1.6.7 Mathematics Intervention Strategies

Mathematics intervention strategies are plans that teachers consciously adopt in an attempt to address barriers experienced by learners when learning mathematics. Landsburg et al. (2016) called for early intervention so that learners' shortcomings are addressed timeously. The DBE (2010, 2011, 2014) developed guidelines and strategies through the Guidelines for Inclusive Teaching and Learning, Curriculum Assessment Policy Statement (CAPS) (DBE, 2011) and the National Strategy of Screening, Identification, Assessment and Support (SIAS) (DBE, 2014a) respectively. These documents assist teachers to be in a better position to provide appropriate support to learners who experience barriers in mathematics.

1.6.7.1 Teachers' professional development

Teachers need to be competent and be capable of teaching and assisting learners who struggle in mathematics. Kumar, Dewan and Subramaniam (2013),stated that there is need for adequate teacher professional development in mathematics. Moreover, Du Preez (2018),declared that the quality of mathematics in schools is dependent on the teachers. However, in many countries, in particular, South Africa, teachers' knowledge of mathematics is alleged to be poor (Pournara et al., 2015).

The above literature reflects the situation in some schools in Johannesburg South District where some teachers require assistance in teaching mathematics to Grades 3 to7. These teachers received little or no mathematics learning during their schooling years.

1.6.7.2 Instructional support

Teachers should use different teaching intervention support strategies to assist learners who struggle in mathematics. Landsburg et al. (2016), discussed support that should be provided to learners who struggle in mathematics. They listed the following:

- Curriculum differentiation–This entails adaptation of tasks to suit the diverse interests, abilities and requirements of learners.

- Scaffolding –Scaffolding requires the teacher to break down learning matter into small activities that follow a logical order. These scaffolds are removed when learners have mastered the concepts and are able to perform tasks independently.
- Activity-based learning –The activity-based learning strategy affords the learner an opportunity to learn mathematics through real life experiences.
- Mnemonics–Mnemonics assist learners to remember information. These can be in the form of rhymes, songs, cue cards, pictures and games.

1.6.7.3 Parental involvement

Parents' involvement in mathematics teaching cannot be overemphasised. There should be home-school collaboration in order for learners who struggle with mathematics to succeed. Soni and Kumari (2017) suggested that children's attitude towards mathematics is shaped by their home environment. To alleviate this challenge, Kormanik (2012)gave examples of mathematics activities that parents can expose their children to for real life application. These include playing mathematics games, real-life shopping, saving money and reading and listening to news. In addition, Landsburg et al, (2016) listed strategies that parents can apply to reduce mathematics anxiety in their children, including avoiding expressing negative attitudes about mathematics; having realistic expectations; providing support and encouragement; monitoring children's progress; and demonstrating positive uses of mathematics.

1.6.7.4 Collaboration

There should be a shared sense of responsibility among all stakeholders in mathematics learning. Teachers, support staff, the community, peers and other stakeholders must work, support and participate meaningfully (Okeke, Van Wyk & Phasha, 2014). Business owners can sponsor mathematics expos and competitions, while peers can assist fellow students. Teachers and support staff need to work together in identifying and supporting struggling learners.

1.7 THEORETICAL FRAMEWORK

This study employs three theories, namely, the social constructivist theory of Levi Vygotsky, bio-ecological theory of Urie Bronfenbrenner and the motivation theory of Abraham Maslow. These theories focus on how the family, teachers, peers and other stakeholders assist in the learning of the child.

Vygotsky's theory is based on the three basic concepts. These are social interactions, the role of MKOs and ZPD. His frame of reference is social constructionist with arights-based epistemology (Phasha & Condy, 2016). He saw disability as a social construct and not a biological defect. He advocated for schools to create positive, healthy and empowering learning environment which facilitates full participation by all learners regardless of learning barriers faced.

Bronfenbrenner's theory was influenced by Vygotsky's social constructionist theory. He identified five contexts (the microsystem, mesosystem, exosystem, macrosystem and chronosystem) within which a child develops. These systems have diverse functions, and each contributes to the development of the child. The theory shows how the family, school, community, culture and economy affect the child's growth. The school, home and community, health personnel and psychologists should form strong working partnerships to assist each individual learner holistically.

Maslow's hierarchy of needs shows how the family affects children's education. Support from the family is crucial. Lack of support in the realisation of needs may lead to serious barriers to learning. His theory has five levels. The first four are basic needs which include physiological, safety, social and esteem needs. Learners need to belong, to be loved, cared for and respected for them to be fully motivated. Lack of these needs may negatively affect their cognitive development and social and learning skills.

The three theories focus on the development and learning of learners. They all allude to the fact that learning is a social activity where all stakeholders need to collaborate in an endeavour to include and assist all learners. In this study, the researcher will investigate whether educators, parents and all stakeholders are fully involved in implementing intervention strategies that assists learners to improve their mathematics understanding.

1.8 RESEARCH METHODOLOGY

Research methodology is coherent group of methods that complement each other in order to collect and analyse data that reflect the research purpose (Henning, Gravett & Rensburg, 2005). The methods are systematic (McMillan and Schumacher, 2010). In this study, the qualitative approach was used.

A qualitative approach considers the participants' views and studies a phenomenon in detail. Furthermore, qualitative research enables a researcher to view participants as human beings with feelings instead of mere sources of information. This study adopted this approach in order to meet the aim of discovering and understanding the experiences of teachers when they implement mathematics intervention strategies.

1.8.1 Research Design

The research design outlines in detail how the research investigation will take place, how evidence or data will be collected, what instruments will be used to address the research question. McMillan and Schumacher (2010) described a research design as a general plan of conducting the research study. Qualitative research designs focus on eliciting the participants' detailed views and experiences which occur in a natural setting. Qualitative research designs include case study, grounded theory, ethnography, phenomenology and action research. Phenomenological research design was used to provide information about the phenomenon being investigated.

1.8.2 Research Paradigm

A paradigm is a worldview that involves philosophical assumptions about the nature of knowledge. A paradigm consists of framework of ideas, values and assumptions (Patton, 2002). These assumptions are ontology ,epistemology and axiology.

1.8.2.1 Ontology

Ontology deals with the reality of nature. Therefore, the ontological assumptions of this study are that learners are performing inadequately in primary school mathematics due to various challenges (Patton, 2002)

1.8.2.2 Epistemology

Epistemology means the way of knowing. This study will make use of the constructivist or interpretive paradigm. The philosophical underpinnings of the constructionist paradigm are informed by hermeneutics (i.e., the meaning of words). This paradigm understands and describes human nature and focuses on action. In the study, participants were actors within their environments and shared their experiences. Observations and interviews were used to collect data (Kawulich &Chilisa, 2015)

1.8.2.3 Axiology

Axiology deals with values and ethics. The axiological assumptions were that all learners, regardless of mathematical barriers experienced, deserve to be afforded the opportunity to learn through effective teaching methods and appropriate intervention (Patton, 2001).

1.8.3 Location

The research was conducted at selected schools in the Johannesburg South District. Teachers were thus, participants in their natural setting.

1.8.4 Sampling

Sampling is a process of selecting a group of people or items from a population for study purposes. In this study, purposeful sampling was used. Purposeful sampling involves selecting a group of people from a population who are representative or informative on the topic of interest (McMillan &Schumacher, 2010). In addition, Cohen, Manion and Morrison (2011) explained that sampling in qualitative research emphasises uniqueness, ideographic and exclusive distinctiveness of the phenomenon.

Teachers who teach mathematics at primary level were selected from three schools. They were sources of rich information since they were knowledgeable and experienced in the teaching of mathematics. Four participants were targeted per school, two men and women from each phase (Foundation, Intermediate& Senior Phase, Grades 1–9). This resulted in the selection of 12 participants.

1.8.5 Research Design

The phenomenological design is concerned with experiences of participants (McMillan &Schumacher, 2010).Participants' interactions and attitudes were studied. Information was gathered by conducting semi-structured interviews.

1.9 DATA COLLECTION

The researcher used the following instruments to gather data.

1.9.1 Observation

Observation is the systematic process of recording behavioural patterns of participants objects and occurrences. This technique, according to McMillan and Schumacher (2010), relies on the researcher seeing, hearing and recording things. The main advantage of observation is that the researcher does not worry about being biased and the information is not limited only to what participants recall.

In this study, the researcher was a complete observer. The selected participants were observed as they applied their mathematics intervention strategies in the classrooms which is their natural environment. This helped the researcher gather reliable and valid information on the teachers' experiences through taking field notes which were analysed later.

1.9.2 Interviews

An interview is a conversation where questions are asked, and answers are given. These usually take place face-to-face and in person. However, modern communication through the internet allows interviews to happen through video conferencing. Furthermore, according to McMillan and Schumacher (2010), the interview technique is flexible and adaptable.

Semi-structured interviews were employed. This allowed participants to elaborate their views and share experiences of teaching mathematics and implementing intervention strategies. Furthermore, this type of interview allowed the participants to reflect, expand

and elaborate on their experiences. All responses were recorded and transcribed for later analysis.

1.10 DATA ANALYSIS

Qualitative data analysis is a process of organising data to making it meaningful (McMillan &Schumacher, 2010). The researcher made use of inductive analysis to analyse data that were collected from individual interviews and organize it into meaningful units through identifying patterns, codes and categories.

1.11 TRUSTWORTHINESS

Trustworthiness entails the way the researcher manages to persuade the audience that the findings in the study are worth paying attention to and that the research is of high quality (Johnson &Turner, 2003). The researcher made sure the research was credible, transferable, dependable and confirmable.

- Credibility: To ensure credibility, the researcher engaged participants in in-depth interviews to produce believable and convincing results. Participants listened to their audio recordings while reviewing the transcriptions to check for accuracy.
- Transferability: The researcher enhanced transferability by providing adequate information about the researcher since he was the research instrument. Further, the researcher provided details of the research context and the processes used.
- Dependability: For the research to be consistent, the researcher used the same interview questions for all the participants. In addition, an in-depth record of the research events was kept in order to account for any changes in the research process.
- Confirmability: The researcher ensured the findings were based on data. The researcher analysed the data in a way that the readers would be able to confirm the adequacy of the findings. The participants also listened to their recorded audios to check for accuracy and were provided with the interview transcripts to read through.

1.12 ETHICAL CONSIDERATIONS

A researcher should understand and follow ethical and legal responsibilities of conducting research involving people (McMillan &Schumacher, 2010). The researcher should protect the rights and welfare of participants by applying ethical principles.

1.12.1 Institutional Approval

Prior to the commencement of the study, the researcher first applied to the Research Ethics Committee of the University of South Africa for ethical clearance (Appendix A). Secondly, the researcher sought permission from the Gauteng Department of Education to conduct the study in selected schools in Johannesburg South District (Appendix B and C). The research only started when permission had been granted. Thirdly, letters were sent to the principals of the selected schools to get their permission to conduct the research (Appendix D).

1.12.2 Voluntary Participation and Informed Consent

Participants were made aware that participation was not compulsory (Appendix E). Furthermore, the researcher informed participants that they could terminate their participation at any time. The participating educators were asked to sign consent forms Appendix F).

1.12.3 Anonymity and Confidentiality

The participants' information shared during the study was confidential and was kept private. The research findings were presented anonymously to protect the identities of the participants.

1.12.4 Respect for Human Dignity

Participants were not subjected to embarrassing or inhumane situations. All participants were treated with respect.

1.12.5 Beneficence and Justice

The researcher treated all participants fairly. Their needs had priority over the research study objectives. An atmosphere of trust and openness was established.

1.12.6 Avoiding Deception

The researcher endeavoured to be honest with participants by offering full disclosure of the purpose of study.

1.12.7 Protection from Harm

The researcher ensured that no participant would be exposed to any harm, be it physical or psychological. The collected information was stored in a password-protected private and confidential folder on the researcher's computer and a lockable file was used for any paper documentation. This was applied from the initial collection point and will continue until the information is no longer needed and is destroyed.

1.13 SCOPE AND LIMITATIONS OF THE STUDY.

These are parameters that limit the amount of research that can be done with limited time, budget and other constraints. This study was undertaken with the intention of establishing teachers' experiences in teaching and implementing mathematics intervention strategies. Only four schools in the Johannesburg South District in Gauteng took part. The fact that only a handful of teachers were involved in the research is a limitation itself. These schools were not a perfect representation of the whole of Gauteng or South Africa. Therefore, the scope of the study is not expansive.

Time was a limiting factor. As a teacher, the researcher found it difficult to be away from work for days. The researcher had to be away from her own class to do observations. Moreover, the researcher intended to conduct interviews during break time and afternoons if the participants were comfortable with the arrangements.

Teachers who were going to participate were volunteers; therefore, the results cannot be generalised to all teachers. There is a possibility that the mathematics teachers who did

not participate were struggling to teach and implement appropriate mathematics inclusive intervention strategies.

1.14 SIGNIFICANCE OF THE STUDY

The research is beneficial to both educators and learners. It endeavours to evaluate the teaching of mathematics teaching and provision of mathematics intervention strategies. Furthermore, it tries to fulfil the vision of a total inclusive learning classroom where all learners' needs are catered for, including mathematics difficulties. The investigation assisted in coming up with strategies that can help teachers turn theory to practice. Workshops that teachers attend are helpful but there is a great need for intensive in-service training including having a resident mathematics expert at each school. Data analysis assisted in finding appropriate strategies and guidance that teachers could use to effectively assist learners in mathematics learning.

1.15 DEFINITION OF TERMS

Barriers to learning: These are difficulties that arise within the education system as a whole, the learning site and/or within the learner him/herself which prevent access to learning and development (DBE, 2010).

Inclusive education: All students regardless of any challenges they may have, are placed in age-appropriate general education classes that are in their neighbourhood schools to receive high quality instruction, interventions and support that enable them to succeed in the core curriculum (DoE, 2001).

Intervention strategies: These are systematic plans of action consciously adopted in an attempt to address and reduce the causes of academic failure.

Learner: Any person, whether child or any adult who receives education or must receive education (South African Schools Act 84 of 1996).

Teacher competence: These are set of skills, knowledge, experience and expertise for teaching and learning activities that will assist in student learning. (Selvi, 2010).

1.16 OVERVIEW OF THE THESIS

This mini dissertation is divided into five chapters.

Chapter 1

This chapter introduced the research study. The background, research problem and aim of the study were presented. Relevant concepts were defined.

Chapter 2

In this chapter, literature review that described primary school teachers' perceptions and experiences when teaching and providing mathematics intervention strategies to the diverse needs of learners was reviewed.

Chapter 3

In this chapter, the focus was on the research design, research methods, data collection strategies and participant selection which were used for the research study.

Chapter 4

This chapter analysed and interpreted data that was collected during the research study to address the research problem.

Chapter 5

This chapter, the study was summarised, conclusions and suggested recommendations for further study provided.

1.17 CHAPTER SUMMARY

This chapter introduced and presented a detailed context and background of the research study. The persistent poor performance in mathematics by most South African learners is a cause for concern. It is at primary school level where learners ought to acquire basic mathematics skills that assists them to excel in mathematics at high school and tertiary levels. The aim of the research was to explore primary school mathematics teachers' perceptions and experiences in teaching and providing intervention strategies. The research methodology to be employed during the research study was outlined. The next

chapter will provide relevant literature on which the study revolves around such concepts as benefits of mathematics, how mathematics is learnt and dyscalculia were reviewed.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

The previous chapter gave a brief introductory literature review to indicate the concepts that will be covered in this chapter. This chapter presents literature review on factors which affect mathematics learning and teaching to diverse learners, and how these factors contribute to low mathematics pass rates in primary schools around Johannesburg South District. This chapter begins by exploring research findings on learner diversity and the teacher's role in promoting diversity. The following sections review literature that discusses how mathematics is taught and learnt by diverse learners internationally and locally. The final part of this chapter focuses on the present and continuing debates around support given to learners experiencing difficulties in learning mathematics and challenges that teachers experience in providing effective support. This study is located in the broad area of inclusion.

At present, the DBE is providing support to teachers in the form of workshops to cluster schools but this is not bringing in the much-needed increase in the mathematics pass rate. Teachers need to receive intensive support in the development of new effective skills and practices for their diverse learners.

2.2 DIVERSE LEARNERS

Diverse learners is a concept that refers to the understanding and recognising the uniqueness of each individual learner due to differences in race, language, culture, gender, ethnicity, socioeconomic status, age, religion, aptitude, personality, appearance, academic, physical and mental abilities (Lemmer, Meier &Van Wyk, 2010). Moreover, it acknowledges that each learner has strengths and weaknesses. This requires that different learning styles are recognised and accommodated, and teachers have the responsibility to come up with lesson plans that cater for learners' diverse needs.

2.2.1 Teaching Diverse Learners

The DBE requires that all learners irrespective of race, gender, language, class, religion, disability, culture and HIV/AIDS status have a right to education and that every learner, if

appropriately supported, can learn (DoE, 2001). However, attainment of quality education by learners is hindered by various factors such as negative attitudes and stereotyping of differences, an inflexible curriculum, inappropriate language of learning and teaching, inadequate polices and legislation, inappropriate communication, inaccessible and unsafe environments, lack of support, non-parental involvement and inadequately and inappropriately trained education managers and teachers (DoE, 2001).

To overcome the learning challenges, teachers who need to provide help to learners with diverse mathematics needs, should possess knowledge and skills to accommodate and assist these learners (DoE, 2001; Mahlo, 2017). The teacher's duty is to promote, encourage and maintain diversity in the class. Diversity is brought by each learner's different background, experiences, likes and dislikes and learning abilities. In addition, teachers should create a positive learning environment where each learner feels they belong and is valued by both the teacher and peers.

For learning to be a success in the diverse classroom, the teacher must know and understand the individual learners so as to incorporate different learning styles. Teacher should promote equal opportunities for learning by providing learning activities that involve participation by all learners. In addition, teachers should afford learners time to share their diversity with their peers. For instance, they can share their cultures such as beliefs, language, clothes and food. Most importantly, a teacher should encourage learners to come up with differing solutions to a problem by offering different learning materials and diverse point of views.

However, the reality is that most teachers have no or little knowledge about handling learners with diverse needs (Phasha, Mahlo &Maseko, 2013). This includes learners who have difficulties learning mathematics. Furthermore, large classes pose a challenge for teachers as they strive to manage mathematics learning difficulties. The Gauteng Department of Education (GDE) in Johannesburg is conducting termly workshops that inform and guide teachers on how to deal with learners who experience mathematics difficulties.

2.3 HOW LEARNERS LEARN IN GENERAL

Learners learn by observing, listening, experimenting, exploring and asking questions. The constructivist view of learning believes that learners construct their own knowledge. Landsburg et al, (2016), discuss the work of two prominent constructivists namely Piaget and Vygotsky. Piaget believes that learners create their own knowledge through assimilation and accommodation. While Piaget concentrates on an individual, Vygotsky focuses on the social aspects of learning (Naude &Meier, 2014). Vygotsky assumes that learning takes place on three levels namely social interaction, interaction with MKOs and the ZPD. Learners have to interact with others and then construct their own knowledge. When studying how learners learn, one can realise that both Piaget and Vygotsky's views are utilised by learners in their construction of knowledge. This phenomenon occurs in the learning of all subjects including mathematics. It is imperative that mathematics is explored.

2.3.1 What Is Mathematics

Mathematics is a school subject that uses the logic of numbers, shapes, quantity and their relationships to solve life problems. Landsburg et al. (2016) described mathematics as a way of arranging communicating and manipulating information using mathematical language. In addition, the DBE (2011) explained mathematics as a language that uses symbols and notations to describe relationships among symbols, numbers, graphs and geometry. Simply put by Naude and Meier (2014), mathematics is a story of how our everyday lives are organised to make sense of the world around us. From the literature cited, mathematics seems to be an interesting subject. However, learners' performance in this subject suggests that it is a difficult and a complicated phenomenon especially when taught and learnt in a classroom of learners with diverse needs.

2.3.2 The Benefits of Learning Mathematics

Mathematics is an important part of our lives and is beneficial. Mathematics is applied in every profession. The Times of India (2015) stated that mathematics gives one the power to reason critically and logically, leads to well-paid jobs, assists in problem-solving and effective communication. Mathematics prepares a person for all-round success in life

especially in the academic and professional fields. Furthermore, mathematics develops lifelong learning skills such as the ability to concentrate, organisational skills, good work ethics and resilience. Moreover, Nautiyal (2012) added that mathematics is used in the advancement of technology. Busiri (2012) stated that mathematics is essential for technological progression and innovation which assists in careers and economic growth. Therefore, it is important that learners attain basic mathematical knowledge and skills and it is the teachers' duty to assist each learner to reach their greatest potential in mathematics activities.

2.4 HOW LEARNERS LEARN MATHEMATICS

Generally, the effective learning of mathematics occurs when the curious nature of learners leads them to test their mathematical ideas in real life (Landsburg et al., 2016; Naude & Meier, 2014). Learners' mathematics activities should be interesting and can be applied in real life contexts. According to Piaget, there are three different types of knowledge. These are the physical knowledge (manipulation of objects); social knowledge (learning from others); and conceptual knowledge (that is own constructed knowledge). Each type is essential in learning mathematics effectively and successfully.

Landsburg et al. (2016) and Naude and Meier (2014) discussed five important strands of mathematics that learners need to be proficient in. These include conceptual understanding (comprehension of mathematical concepts, operations and their relations); procedural fluency (the skill of carrying out procedures); strategic competence (the ability to solve mathematical problems); adaptive reasoning (The capacity for logical thought); and productive disposition (the ability to make sense of mathematics).

2.4.1 International Perspectives on Learning Mathematics

Learning mathematics is an integral part of education. Internationally, countries such as America, China, England and Singapore have made it mandatory to learn mathematics.

In Singapore, Shanghai and China, their curricula aim to assist learners to acquire mathematical concepts and skills (Kaur, 2015). Li, Mok and Cao (2019) stated that there are mandatory curriculum standard that guides for all teaching and learning. These East Asian countries use the 'mastery approach' to enhance mathematics learning. Learners

develop conceptual and procedural knowledge through rigorous practice (The Conversation, 2014). Learners start learning mathematics facts at an early age. These facts assist learners to improve their speed of learning mathematics. Furthermore, with the mastery approach, learners learn a specific concept before moving to a more complex one in a rigid linear progression and mathematical thinking is encouraged during classroom instruction.

Western countries like America and England use the 'mind set approach' where teaching of mathematics begin with a broader concept before breaking down the concept into smaller specific steps for solving. However, England introduced the 'mastery approach' in 2015 and later included it in its policy in mathematics education (Boylan, Maxwell, Wolstenholme, Jay & Demack, 2018). England adopted the mastery approach used in the East Asian countries, after Singapore's and Shanghai's success in transnational assessments such as Programme for International Student Assessment.

The adoption of the approach confirms that mathematics education is dynamic hence the need for educators to professionally develop themselves constantly. This will help them keep abreast with current trends and to be in a better position to assist learners who struggle.

2.4.2 National Views on Learning Mathematics

In South Africa, mathematics learning is now compulsory from grade R to 12 (Jojo, 2019). The South African government's goal is to have numerate learners. Therefore, the CAPS document (DoE, 2011) mandates educators to equip learners with mathematics skills to solve problems in real life.

The approach that CAPS uses is prescriptive and demands uniformity (Jojo, 2019; Long& Dunne, 2014). The CAPS curriculum was adopted to promote inclusivity. It accommodates learners from various backgrounds and with varying learning styles. In addition, the CAPS curriculum is structured to help direct the educators. Teachers are directed on what to teach on a daily basis (Long & Dunne, 2014). However, mathematics teaching and learning in South Africa is still not yielding the intended outcomes of the

policy and curricula (DBE, 2018). The DBE is calling for a multi-dimensional approach to transform the learning of mathematics in South Africa.

2.5 QUALITIES OF A MATHEMATICS TEACHER

Teachers need to be competent and know their subject matter (Mahlo, 2017). However, this is not the case regarding teaching of mathematics. Knievel et al. (2015) stated that teachers' specific subject cognition is seen as an important factor for quality of instruction. Mkhize and Maistry (2017) echoed the same sentiments when they mentioned that university lecturers around the world cite lack of adequate mathematical knowledge and computational skills amongst students. This means these students did not receive appropriate mathematical interventions during their primary and secondary education.

Pournara et al. (2015) claimed that in South Africa, teachers' mathematical knowledge is generally poor and that there are instances where it has been proved that teachers do seem to struggle with mathematics concepts that they teach to learners. For teachers to support struggling learners in mathematics, they need to know how mathematical processes work and be enthusiastic about their subject so that learners will be attracted to it and find it interesting.

2.6 LEARNING ENVIRONMENT

A learning environment should be a space where learners' intellectual ability is developed, confidence is promoted, meaningful learning takes place and struggling learners are effectively supported. Furthermore, a learning environment is a place where social, psychological and pedagogical learning processes have a positive influence on the learners' achievements and behaviours. The DBE (2017) described a "learning environment" as a place where learning occurs. It is a school atmosphere which is orderly, calm and harmonious. For the learning environment to be conducive to mathematics learning, physical resources need to be available; curriculum must be flexible; teaching strategies must be varied; and teachers' competence and attitudes must be appropriate.

However, the situation in South Africa and other African countries is such that the classrooms are overcrowded; teachers are incompetent there is inadequate mathematics support for learners; the curriculum is inflexible; and attitudes towards mathematics are

predominantly negative, leading to a hostile learning environment which is not conducive and ineffective.

2.7 CHALLENGES OF IMPLEMENTING MATHEMATICS INTERVENTION STRATEGIES

2.7.1 Dyscalculia

Dyscalculia involves a wide range of mathematics learning difficulties. Dyscalculia causes mathematical problems in academic and occupational performance (Morsanyi, 2019). In addition, Zerafa (2015) described dyscalculia as a learning difficulty which hinders learners from developing basic number concepts. Learners who have dyscalculia have difficulty understanding anything that involves numbers. This difficulty with mathematics is neither explained by low intelligence nor inadequate schooling and yet 5–7% of primary school learners are affected (Kaufmann& Von Aster, 2012).

Dyscalculia varies from person to person but there are effects which are common. More often than not, dyscalculia and mathematics anxiety are regarded as the same but, according to Zerafa (2015), dyscalculia is a learning issue that affect mathematics skills, facts and understanding of concepts. Furthermore, dyscalculia is associated with mental disorders and does not improve with treatment. It is known to persist to adulthood. On the other hand, mathematics anxiety is an emotional issue involving self-doubt and fear of failing. Manifestations or effects of dyscalculia are the same as those for mathematics anxiety which is discussed later.

2.7.2 Effects of Dyscalculia

Dyscalculia presents various learning difficulties with mathematics. Landsburg et al. (2016) and Kaufmann and Von Aster (2012) listed the following effects of dyscalculia:

- difficulty remembering mathematics facts, formulae and sequencing steps; therefore counting, calculations and establishment of basic number sense is inhibited;
- learners forgetting previously learned skills and the inability to generalise acquired mathematical skills and losing track when counting, adding or subtracting. Further, these learners struggle with time reading as well as time management;

- learners having short attention span and leaving work incomplete, carelessness and making considerable unnecessary mistakes;
- struggling with abstract and symbolic thinking; in other words, learners struggle to relate manipulatives to symbolic representation;
- having difficulties in interpreting word problems;
- having emotional challenges such as stress and lack of motivation;
- causing mathematics anxiety and general school phobia.

Mathematics anxiety causes learners to acquire a negative attitude towards mathematics-related activities even outside the classroom. Affected learners will avoid any games that involve counting. This leads to the question of what mathematics anxiety is.

2.7.2 Mathematics Anxiety

Mathematics anxiety is the negative emotion that interferes with solving mathematics problems. Ramirez, Shaw and Maloney (2018) described mathematics anxiety as the feeling of fear and tension that people experience when dealing with mathematics. Pearn (2014) mentioned that people with mathematics anxiety become agitated when working with numbers.

2.7.2.1 Manifestations and dyscalculia mathematics anxiety

Learners who have difficulties in mathematics due to anxiety avoid mathematics activities. If involved in these activities, their hands get sweaty; they show signs of confusion; and they do not know where to start. Their strategies and methods are structure less and haphazard (Landsburg et al., 2016; Pearn, 2014; Picha, 2018). Moreover, during oral work, they do not want to participate and are unsure of how to respond to questions. They panic and at times show sadness or anger. Some learners become disruptive.

When learning mathematics, these learners work slowly and make unnecessary errors. Learners with mathematics anxiety encounter problems when estimating quantity and counting forwards and backwards. They lack clarity on the concept of measurement. These learners often misunderstand the main operation symbols. They experience difficulties with place value and cannot round off numbers (Landsburg et al, 2016). These

learners require considerable support especially from teachers, parents and peers. Therefore, it is imperative that the learner's support structures demonstrate a positive attitude towards mathematics.

2.7.2.2 Support for learners with mathematics anxiety

The way mathematics is taught can cause anxiety (Pearn, 2014). Therefore, teachers are expected to assist learners who struggle with mathematics by using appropriate support strategies. Landsburg (2016; Pearn, 2014; Picha, 2018) suggest the following strategies :

- learning content should suit the different learning abilities of learners and clear instructions to be provided.
- use learning materials and teaching strategies that will accommodate all learners' different learning styles.
- to make a follow up to check if learners are grasping concepts being taught.
- make use small groups to teach mathematics
- learners to be given adequate practice to solve mathematics problems
- teachers to assist learners to use a variety of problem solving strategies and learners to be in charge of their own learning.
- make use of appropriate language that learners understand to explain new concepts
- offer learners support and motivation
- instil in learners that mistakes are part of learning mathematics and that learners

Teachers cannot support learners if they do not take responsibility for their own learning (Farooq& Shah, 2008). Learners should practise mathematics every day and should use good practice methods. Moreover, they should ask for help.

Parents are role models to their children especially the young ones. Therefore, attitudes and beliefs with regard to mathematics play a vital role in learners' acquisition of mathematical knowledge and skills. Parents should have realistic expectations and should not put pressure on the child (Landsburg et al, 2016). Instead, they should provide support and encouragement in order to help reduce the child's mathematics anxiety. Parents should demonstrate positive uses of mathematics in real life situations.

2.7.3 Attitude and Beliefs

Teachers, learners, parents and peers' attitudes and beliefs play a major role in the teaching and learning of mathematics. Attitude reflects one's feelings, emotions or behaviour. Mkhize and Maistry (2017) described attitude as a learned tendency by a person to react positively or negatively to a situation, idea, object or another person. Therefore, attitude towards mathematics by those around the learner affects how the learner acquires mathematics knowledge and skills.

Teachers influence on learners' learning is of paramount importance. Domino (2009) and Farooq (2008) alleged that mathematics teachers' behaviour has a huge impact on whether the learner likes or dislikes mathematics. In addition, Mata et al, (2012) concluded that in classrooms where teachers are seen as supportive, students feel in control and confident of their ability to succeed in mathematics.

Parents and peers are equally important in the learners' acquisition of mathematics skills and knowledge. Soni and Kumari (2017) and Wainwright (2011) discussed the effects of parental attitudes, beliefs and involvement in the learning of mathematics and they noted that children's attitude towards mathematics is affected by their parents. The more the parents are involved, the more learners succeed. Of equal importance are peer attitudes towards mathematics. Peers who are knowledgeable and skilled in mathematics assist their peers to gain the use of mathematical language and self-confidence (Austin, 2008).

2.7.4 Lack of Parental Support

Most parents in African states are affected by political histories of their education where mathematics was not seen as a necessity for black people (Roberts, 2017). As a result, these parents do not possess the will or skill to assist their children with mathematics either by motivation or pedagogy. If parents` view and consider mathematics to be a valuable and interesting subject, learners will be influenced in being diligent in their learning of mathematics (Soni& Kumari, 2015).

2.8 MATHEMATICS INTERVENTION STRATEGIES TO SUPPORT DIVERSE NEEDS OF LEARNERS

Mathematics intervention strategies are plans that teachers consciously adopt in an attempt to address barriers that learners experience during mathematics learning. There should be early intervention so that learners' short comings are addressed timeously. The DoE (2010, 2011, 2014), developed guidelines and strategies through the Guidelines for Inclusive Teaching and Learning, CAPS (2011) and the National Strategy of Screening, Identification, Assessment and Support (2014) respectively. These documents assist teachers to be in a better position to provide appropriate support to learners who experience barriers in mathematics by using strategies such as the following.

2.8.1 Teacher Professional Development

Teachers need to be competent in teaching mathematics to learners with diverse needs and most importantly to learners who are struggling with mathematical concepts (Pretorius, 2013). Du Preez (2018) stated that the quality of mathematics in schools depends on teachers. However, in many countries including South Africa, teachers' knowledge of mathematics is alleged to be poor (Pournara et al., 2015).

The above literature reflects the situation in some schools in Johannesburg South District where most teachers need professional development with regard to teaching Grades 3 to 7 mathematics. Their mathematics background consists of little or no mathematics education during their schooling years. This is a huge challenge because these teachers are incapable of teaching mathematics concepts or assisting struggling learners.

2.8.2 Instructional Support

Teachers should use different teaching strategies to assist learners with diverse needs and also come up with appropriate intervention strategies to assist struggling learners in mathematics. These intervention strategies are discussed below.

2.8.2.1 Curriculum differentiation

This entails adaptation of tasks to suit the diverse interests, abilities and requirements of learners such as different learning styles. Furthermore, curriculum differentiation requires

modifications, adaptations, assessment strategies and different teaching methodologies (DBE, 2017; Landsburg et al. 2016). For curriculum differentiation to be fully realised, educators need to acknowledge that learners are different and should be afforded opportunities to learn. Inflexible curriculum is one of the major barriers in education that leads to exclusion of some learners in the classroom. Educators need to differentiate content, teaching methodologies, learning environments and assessment (Dorgu, 2015; Marais, 2016). In addition, curriculum differentiation involves teaching the same content to learners of varying abilities using different instructional strategies. Content needs to be broken into small chunks.

2.8.2.4 Scaffolding

Scaffolding requires the teacher to break down learning matter into small activities that follow logical order. These scaffolds are removed when learners have mastered the concepts. Scaffolding, according to the DBE (2017), promotes supportive learning and improves learning in the classroom. When a new mathematical concept is introduced, learners need to be provided with lots of support. This can be in the form of concrete objects such as counters, charts and cues. However, as the learners grasp the concept, they start working in abstract, meaning that scaffolds will no longer be necessary. They should begin to enjoy mental mathematics activities. In spite of this, most learners in general do not enjoy mathematics in primary schools.

2.8.2.3 Cooperative learning

This strategy puts learners into small groups which consist of learners with different abilities. Members of a group, co-ordinate their activities to facilitate the learning of other group members. All members of the group are actively involved. When learners work as a group, they develop academic, social, affective and psychological skills. Landsburg et al, (2016) discussed the following gains for cooperative learning. Learners have improved academic achievement; all learners are involved in learning regardless of barriers they are experiencing; there is an improvement in attitude towards learners who struggle; learners' social skills improve and learners' self-esteem is improved.

Cooperative learning in mathematics assists learners to work together to find a solution to the problem. This is made possible by elements such as positive interdependence, individual or group accountability, appropriate use of cooperate skills, equal chances for success, learner reflections, interpersonal skills and face-to-face interactions (DBE, 2010). When learners work through their mathematical problems, the group uses a variety of activities and each member of the group coordinates, participates fully and is accountable so that each member learns something.

To sum it up, cooperative learning tends to result in greater achievement, more positive relationships, boosted self-esteem and greater psychological help.

2.8.2.4 Activity-based learning

Learners, who struggle in mathematics, need to use the activity-based learning strategy so as to enable learners to learn through personal experiences. Activity-based learning should occur in natural settings, thus moving it from being a solely classroom-based activity to encouraging and preparing learners to learn in a community-based setting. Therefore, learners can learn the topic 'money' by visiting their school tuck-shop and finding out about prices and giving change after selling. Learners can go in small groups to promote active participation from each learner. Activity-based learning needs to be used especially when teaching learners who face barriers to learning (DBE, 2011).

2.8.3 Parental Involvement

Parental involvement in mathematics cannot be over emphasised (Wainwright, 2011). There should be home-school collaboration in order for learners who struggle with mathematics to succeed. Soni and Kumari (2015) alleged that children's attitude towards mathematics is shaped by their home environment. In order to alleviate this challenge, there are activities that parents can expose their children to for practical mathematics application. These include playing mathematics games, real-life shopping, saving money and reading and listening to news. Parents need set the example by being interested in mathematics. Some parents are proactive while others cannot help their children with mathematics homework for various reasons, such as the parents' own lack of skill or poor education.

2.8.4 Collaboration

There should be shared responsibility among all stakeholders in mathematics learning. Teachers, support staff, the community, peers and other stakeholders must network, support and participate meaningfully (Okeke et al. 2014). Business people can sponsor mathematics expos and competitions while peers, teachers and the support staff work together in identifying and supporting struggling learners.

2.9 CHAPTER SUMMARY

The chapter reviewed the literature on factors affecting mathematics learning and teaching to diverse learners. Challenges encountered were discussed. These included dyscalculia, mathematics anxiety, negative attitudes and beliefs towards mathematics, teachers' incompetence and lack of parental support. In addition, intervention strategies to support learners experiencing mathematics difficulties were suggested. Teachers' professional development and competence is seen as a major factor in improving learners' acquisition of mathematical skills. The following chapter focuses on the methods and procedures that were used to collect and analyse data in order to answer the research problem which focuses on teachers' experiences in teaching mathematics.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter outlines research methods that were used to conduct the study. It provides the theoretical frame work used. Further, the chapter describes how participants were selected, the study location, instruments used during data collection and how data were analysed to address the research questions and objectives. In addition, ethical considerations to be adhered to during the research process are outlined.

3.2 THEORETICAL FRAMEWORK

Three theories, namely, the social constructivist theory by Levi Vygotsky, bio-ecological theory by Urie Bronfenbrenner and the motivation theory by Abraham Maslow were used in this study. These theories provided a conceptual framework for understanding how teachers could work with the family, peers and other stakeholders in offering learning support to learners who have learning difficulties including in mathematics.

Vygotsky's social constructivist theory consists of three concepts, namely, social interactions, knowledgeable other and the ZPD (Woolfolk, 2007). Vygotsky's term of reference is a social constructivist and rights-based epistemology and that "no child is without ability" (Phasha & Condy, 2016). Therefore, schools, homes and the community need to create a positive, healthy and empowering environment which facilitates full participation by all learners regardless of barriers being experienced. Policy, legislation and teachers should provide learners who struggle with mathematics concepts with relevant, meaningful and flexible activities that will improve their mathematical skills.

Vygotsky's theory influenced Bronfenbrenner's bio-ecological theory. The bio-ecological theory consists of five contexts, namely, the microsystem, mesosystem, exosystem, macrosystem and the chronosystem (Landsburg, 2016). These systems have diverse functions and each contributes to the development of the child. The theory explains how the family, school, community, culture and economy affect the child's growth. It is therefore imperative that learners who struggle with mathematics be offered learning support from different levels of society. The school, home and community and other

stakeholders should form strong partnerships that could assist learners who experience learning barriers such as understanding of mathematics concepts.

Maslow's theory of hierarchy of needs show how the family affects children's education. Support from the family is crucial. Lack of support in the realisation of these needs may form severe barriers to learning (Woolfolk, 2007). Maslow's theory has five levels. The first four are basic needs. These include physiological needs, safety needs, social needs and esteem needs. Learners need to have food, be healthy, to belong, be safe and be confident. Lack of social needs may affect their cognitive development and social learning skills. Learners, who attend school without food or proper clothes and are from broken homes, find it difficult to concentrate in class. Maslow's theory calls for environments that are welcoming, accommodative, caring and supportive. Moreover, family involvement in the children's learning is of paramount importance.

The three theories focus on how learners develop and learn. They allude to the fact that learning is a social activity where all stakeholders should collaborate in an endeavour to include and assist all learners. In this study, factors that contribute to learners to struggle in mathematics are examined.

3.3 RESEARCH PARADIGM

A research paradigm is a framework of ideas, values and assumptions that a researcher assumes constitute knowledge and truth about a research problem that is being studied(Patton, 2002). A paradigm is further defined as a shared worldview and a set of beliefs that guides the researcher's inquiry (Kawulich& Chilisa, 2015; Rocco, Bliss, Gallagher &Perez-Prado, 2003). In addition, Khan (2014) described a research paradigm as a structure or a set of suppositions and ideas that assist the researcher see what the world looks like in relation to assumptions. A research paradigm provides rules and techniques which help the researcher identify a problem, give direction on how to solve it and provide findings and justifications that are acceptable for further reference (Kuhn, 1970). Therefore, a paradigm provides questions and research methods to be used to assist in understanding the research inquiry. Moreover, a good research paradigm

enables the researcher to answer the research problem at hand from different perspectives. That makes the research findings authentic.

There are a number of research paradigms that researchers can use during research. First, is the positivist/post-positivism paradigms, which are concerned with strict empirical approaches. Neuman (2011), described the positivist view of the world as objective where behaviour and cause and effect can be measured and human activities predicted. This is usually used in quantitative research. Second, constructivism/interpretivism approaches emphasise multiple socially constructed realities and seek to understand human nature. Individuals view the world according to their own experience and contexts. Third, is the transformative/emancipatory approach which destroys myths and empowers society in terms of understanding social factors while the post-colonial/indigenous paradigm promotes transformation and social change from former colonisation among the historically oppressed (Patel, 2015).

In this study, the researcher used the constructivist paradigm which seeks to understand human experiences. The researcher sought to understand primary school teachers' experiences of teaching mathematics to learners with diverse needs. The constructivist paradigm allowed the researcher to conduct the research in natural settings; in this case, in schools where teaching of mathematics occurs.

A research paradigm is informed by philosophical assumptions about the nature of reality (ontology), the ways of knowing (epistemology) and ethics and value system (axiology) (Patton, 2002).

3.3.2.1 Ontology

Ontology is the nature of reality. The constructivist paradigm believes that there are many intangible realities constructed by people. Furthermore, reality is limited to context, space, time and the population. Reality, according to the constructivist paradigm, cannot be generalised. Therefore, in this study, the ontological assumptions were that learners were performing unimpressively in primary schools because of various challenges such as teacher incompetence, dyscalculia, attitudes, inadequate teacher training and other challenges.

3.3.2.2 Epistemology

Epistemology involves the ways of knowing the truth (Patton, 2002). It deals with how we know what we know (Kawulich & Chilisa, 2015). Therefore, epistemology is concerned with the sources of knowledge and their reliability. The constructivist paradigm believes that knowledge is subjective and that the truth depends on human experiences and it depends on the context. In this study, the researcher engaged teachers and let them narrate their perceptions and experiences regarding teaching of mathematics to learners with diverse needs. This was done through observations and interviews conducted at the participants' schools.

3.3.2.3 Axiology

Axiology is concerned with ethics and the value system (Kawulich & Chilisa, 2015). The researcher's axiological assumption was that all learners, regardless of mathematical barriers experienced, deserve to be afforded an opportunity to learn mathematics. This could only be achieved if teachers are competent and have a positive attitude towards mathematics. This Creswell, 2014)applies to parents, peers and other stakeholders. With appropriate interventions and effective teaching strategies, all learners can be mathematically literate.

3.4 RESEARCH METHODOLOGY

Research methodology is a systematic and purposeful plan of conducting research in order to solve a research problem (Kothari, 2004; McMillan & Schumacher, 2010). In addition, research methodology assists the researcher to choose appropriate research approach, the research design and research paradigm (Creswell, 2014). In research methodology, specific procedures and techniques are used to conduct research process efficiently.

3.4.1 Research Approaches

Research approaches are plans and procedures for research. Broad assumptions are detailed methods of data collection, analysis and interpretation (Creswell,2014). In this study, qualitative and quantitative approaches were discussed.

A qualitative approach is concerned with understanding the social phenomenon under investigation from the participants' viewpoint. Qualitative research describes events that occur during a study. Further, a qualitative approach explores participants' perceptions and experiences (Botma, Greef, Mulaudzi & Wright, 2010; Merriam, 2009). Qualitative research approach uses methods which are flexible, where strategies change as the data collection strategy progresses.

A quantitative research approach emphasises objectivity in measuring and describing the research phenomena (McMillan & Schumacher, 2010). A quantitative research approach uses experiments which are administered to a large group of objects or people (Creswell, 2014). The Researcher is guided by a set of procedures and endeavours to be objective of the phenomenon being studied. Data is interpreted statistically.

In this study, a qualitative research approach was employed by using phenomenology design. The researcher collected information about participants' lived experiences in their natural settings which included participants 'everyday experiences in the classroom when teaching mathematics to learners with diverse needs. Moreover, the exploratory and describe nature of participants' experiences in detail and enables readers to understand the nature and impact of the problem as well as the meaning attached to the participants experiences. In that regard, the phenomenology research design was employed.

3.4.2 Research Design

A research design is a general plan and procedures or a structure of how the researcher intends to conduct the research in order to answer the research question (Akhtar, 2016; Babbie & Mouton, 2012, Creswell, 2009; Khothari, 2004). The research design specifies the procedure and methods used to collect and analyse data. Phenomenology design was used in this study. Phenomenology is a research design which entails participants describing and interpreting their lived experiences (Creswell, 2014, McMillan & Schumacher, 2010).

Participants were primary school teachers who taught mathematics. Participants shared their experiences regarding teaching and providing mathematics intervention strategies

that were given to learners who needed support. The researcher in this study obtained first-hand information from the participants when conducting one on one interviews

A research design process begins with philosophical assumptions that researchers make when they decide to conduct a research study (Creswell, 2007). Researchers have their own worldviews and beliefs or paradigms that they bring to the research study. The research paradigm forms a frame of reference for our observations and reasoning.

3.5 LOCATION

The research was conducted in three primary schools in Johannesburg South District, also known as D11, in Gauteng Province, South Africa. Two of these schools were government schools and one was a private school. One government school was opened in 1912 and the other was opened in 1955. The private school was opened in 2013. Interviews and observations were carried out in educators' (participants) classrooms. Classrooms were participants' natural environment.

3.6 SAMPLING

The sampling method of a research study is determined by the population, required sampling size and the method of data analysis that is used. In this study, purposive sampling was used. Purposive sampling helped the researcher in choosing participants according to specific criteria who had the information needed to answer the research question (Cohen, Manion &Morrison, 2011). Therefore, twelve teachers who taught mathematics at primary school level in three schools in Johannesburg South District participated in this study.

Schools were chosen according to when they were established, learner enrolment, type of school, that is, government school or private school. Two government schools and on private school were sampled. Four teachers were chosen per school. Their age groups ranged from 24–58. The researcher endeavoured to interview equal number of females and males per school. All participants interviewed were either college or university-trained graduates.

3.7 DATA COLLECTION

Data collection is the gathering of information about the phenomenon being studied to enable the researcher to answer the research questions (McMillan & Schumacher, 2010). Data collected needs to be accurate to ensure the integrity of the research. There are various data collection strategies used in qualitative research. These include in-depth interviews, focus groups and observations.

During the research, the following the following data collection methods were employed: observations and one-on-one semi-structured interviews with 12 teachers who taught mathematics from three primary schools in the Johannesburg South District.

3.7.1 Observations

An observation is a systematic process of recording behavioural patterns of participants, objects and occurrences. This technique, according to McMillan and Schumacher (2010:208), relies on the researcher seeing, hearing and recording things.

Participants were observed as they gave their responses during the semi-structured interviews. This assisted the researcher to gather information by taking field notes. These field notes were analysed together with the interview transcripts.

3.7.2 Interviews

Interviews involve having a conversation where questions are asked and answers are given. Interviews are a popular way of collecting data in qualitative research (Griffee, 2005). Moreover, interviews are flexible and adaptable. They can be structured or unstructured.

Semi-structured interviews were used in order to gain a detailed picture of what transpires in the classroom when teachers are teaching mathematics and providing support. This type of interview is simple and practical. Semi-structured interviews allowed the researcher and participants to be flexible. Participants had enough time to talk about their opinions and experiences when teaching mathematics. The aim of the interview was to understand the participants' point of view. The researcher used prepared, open-ended questions to build rapport with the participants. Points made by participants were probed.

3.8 DATA ANALYSIS

Data analysis organises, interprets and summarises data. Similarities and differences are identified (McMillan & Schumacher, 2010).Interpretive Phenomenological Analysis was employed. Interpretative Phenomenological Analysis (IPA)examines and explores in detail the lived life and experiences of participants (Smith & Osborne, 2015).

The IPA involved both researcher and participants. Participants interpret their world while the researcher interpreted the participants' interpretations (Smith & Osborne, 2015).The researcher analysed data collected from semi-structured interviews and field notes. Data was interpreted and transcribed into meaningful units through identifying patterns, codes and categories.

3.9 TRUSTWORTHINESS

Trustworthiness is the degree of confidence concerning data obtained, its interpretation and strategies employed to ensure quality of the study(Connelly, 2016). Trustworthiness requires that the researcher establishes confidence, genuineness, applicability and consistency in the research (Anney, 2014). Moreover, trustworthiness entails the way the researcher manages to persuade the audience that findings in the study are worth paying attention to and that the research is worthy (Johnson &Turner, 2003). In addition, Gunuwan (2015) mentioned that a study is regarded to be trustworthy if the reader of the research report judges it to be. Therefore, the researcher ensured that the research was credible, transferable, dependable and confirmable.

3.9.1 Credibility

Credibility is the confidence that can be placed in the research findings (Connelly, 2016:435). Credibility should ascertain if the research findings are a true representation of the participants' original data and views (Nowell, 2017).

To ensure credibility in this study, the researcher was involved in prolonged interviews with the participants. The researcher observed participants and asked them to listen to their recorded interviews to check for accuracy.

3.9.2 Transferability

Transferability refers to the degree to which qualitative research findings are applicable to other contexts, situations and phenomena. The researcher demonstrates transferability by giving detailed descriptions (Connelly, 2016; Nowell, 2017). In this study, the researcher enhanced transferability by providing adequate and descriptive information about research findings, research context and research processes. This assists the reader to decide if the research findings can be transferred to other contexts and situations.

3.9.3 Dependability

Dependability is a question of stability and consistency of research findings over time (Connelly, 2016). The researcher has to make sure that the research is logical, traceable and clearly recorded (Nowell, 2017). For this study to be dependable, the researcher used the same research instrument for each participant. All the research records for the study were kept for the purposes of accountability for any changes in the context of the research process.

3.9.4 CONFIRMABILITY

Confirmability is to the extent to which the results of a research can be confirmed by other researchers (Connelly, 2016). Further, confirmability is concerned with whether the researcher's interpretation and findings are derived from data supplied by participants and not from the researcher's bias or personal interests (Nowell, 2017). Confirmability provides a rationale for all decisions taken during the research process. Therefore, in this study, the researcher collected data from participants regarding their experiences in teaching mathematics in primary schools and analysed it in a way that is confirmable.The confirmability process involves participants evaluating the research findings, interpretations and recommendations.

3.10 ETHICAL CONSIDERATIONS

It is the researchers' responsibility to adhere to ethical and legal responsibilities of conducting research that involves human beings (McMillan & Schumacher, 2010). The

researcher should be honest, respectful and protect the rights of participants during the research process. In this research study, several ethical considerations were taken into account to ensure that the study is conducted appropriately. The following principles were applied.

3.10.1 Institutional Approval

Prior to the research study, the researcher applied for ethical clearance from the Research Ethics Committee of the University of South Africa (UNISA) and it was granted (See Appendix A).Secondly, the researcher sought for permission from the Gauteng Department of Education before commencing with research in three selected schools in Johannesburg South District (See Appendices Band C).Appointments were made with principals of the selected schools (See Appendix D).When permission was granted, the researcher engaged with participants.

3.10.2 Voluntary Participation and Informed Consent

This researcher made participants aware that participation is not forced or coerced, instead it is voluntary (See Appendix E). Further, participants were informed that they could terminate participation at any time without incurring any penalties. The researcher provided sufficient information about the research and participants were informed about the purpose of the research, methods that will be used, possible research outcomes, demands and possible inconveniences that could be encountered.

3.10.3 Anonymity and Confidentiality

The researcher assured participants that information gathered in this study would be kept anonymously and with strict confidentiality. Participants' names would not be recorded anywhere and no one would connect the answers given during the interviews with them. Participants were referred to by codes in any recordings and publications. Hard copies of interview data would be kept in a secure and lockable steel cabinet and soft copies will be stored in a password-protected computer until they are no longer required.

3.10.4 Respect for Human Dignity

Human dignity refers to the notion that every individual is unique and valuable and should be treated with the highest respect, care and integrity (Andorno, 2014).Moreover, humans should not be degraded or humiliated in any way. The researcher protected the participants' integrity, their freedom of choice, respected their privacy and protected them from any discomfort. Respect was ensured by not subjecting participants to any embarrassing and inhumane situations. The interviews did not involve asking personal information.

3.10.5 Beneficence and Justice

A researcher should have the interest of participants in mind during research. Participants should not be harmed. Ferreira and Serpa (2018), suggested that a researcher should aim to minimise risks and maximise benefits to participants. During the research, participants were not harmed since the research study involved non-vulnerable adult participants. Non-sensitive information was involved. Moreover, all participants were treated fairly, equally, and with concern and respect. Interviews were conducted at the convenience of the participants. The researcher created an atmosphere of trust and openness to all participants.

3.10.6 Avoiding Deception

In research, deception occurs when the researcher falsifies information and intentionally misleads participants about the intended research. The researcher was honest, sincere and offered full disclosure about the purpose of the study, who would have access to information and what the intended use of the information was.

3.10.7 Protection from Harm

The researcher ensured that participants did not suffer from distress. Participants were not exposed to any harm, be it physical or mental. The research interviews did not include embarrassing, frightening and offending questions.

3.11 CHAPTER SUMMARY

The chapter outlined how research was conducted using the qualitative research design and which research paradigms were employed. The chapter illustrated how the process was used to select participants who teach mathematics at primary school. In addition, the chapter described the method that was used to collect data, what approach was employed and how collected data were analysed. The ethical principles to be adhered to when carrying out the research process were outlined. The next chapter focuses on the process of analysing collected data and describing the research findings.

CHAPTER 4: INTERPRETATION OF DATA, FINDINGS AND DISCUSSION

4.1 INTRODUCTION

This chapter discusses the analysis and interpretation of findings resulting from data collected during the field study. The phenomenological research design was used and data were sourced from participants using semi-structured interviews. Therefore, Interpretative Phenomenological Analysis was used to analyse data. Participants were teachers from three schools in Johannesburg South District. Data collected was analysed and four themes emerged. The purpose of the study was to explore teachers' perceptions and experiences when providing mathematics intervention and support to learners with diverse needs. The findings are presented in relation to the research question and objectives stated in the study.

The research question was "What are teachers' experiences when teaching mathematics at primary school?

The research objectives were:

- to establish teachers' perceptions regarding mathematics teaching and learning;
- to explore mathematics teaching intervention strategies teachers administered to cater for the diverse learners learning needs;
- to determine knowledge and skills teachers possessed on teaching mathematics and how they can be empowered.

In this study, participant information will be supplied. However, for confidentiality reasons, participants are coded as P1 to P12. This is followed by analysis and interpretation of the findings.

4.2 DATA ANALYSIS

Data analysis assists in making sense of data that has been collected (Creswell, 2014).In this study, data were collected. Themes, patterns and relationships were established by discovering similarities and differences data supplied by each participant.

Although the original plan was to have 12 participants, only 11 participants were interviewed. The twelfth participant indicated that she could not continue with the research process dueto personal reasons. They were from three primary schools. Out of the 11 participants, 8 were women and three were men. Information gathered from participants included age, gender, status at school, qualifications, years of teaching experience as well as learner support training in mathematics.

Table 4.1 below provides information about the participants of this research study.

Table 4.1: Participants' information

Participant	Age	Gender	Status at school	Qualification	Teaching experience (years)	Learner support training (Y/N)
P1	39	F	Permanent	B.Ed. degree	11	Y
P2	48	F	Permanent	B.Ed. degree (Honours)	14	Y
P3	48	M	Permanent	B.Ed. degree	3	N
P4	58	F	Permanent	Teaching Diploma	25	N
P5	46	M	Permanent	Teaching Diploma	24	N
P6	48	M	Permanent	Teaching diploma	10	N
P7	53	F	Permanent	Teaching Diploma	27	N
P8	52	F	Permanent	Teaching diploma	25	N
P9	27	F	Permanent	B.Ed. degree	1	Y
P10	24	F	Permanent	B.Ed. degree	3	Y
P11	27	F	Permanent	B.Ed. degree (Honours)	5	Y

Table 4.1 showed that the age group of participants ranges from 24 years to 58 years. All participants were either college or university graduates. Teaching experiences ranged from 1 year to 27 years. Only four participants had learner support training. More women participated than men. P1 to 4 came from School A, Participants 5 to 8 came from School B while the last three, Participants 9 to 11, came from School C. School A had three female participants and one male participant. School B had two males and two female participants while School C's participants were all women. Participants 1, 2, 5,6, 9 and 10 were Foundation Phase teachers while participants 3,4,7,8 and 11 were Intermediate and Senior Phase teachers.

4.4 RESEARCH FINDINGS

Themes the researcher formulated were influenced by the participants' experience in teaching mathematics to primary school learners. Participants shared both the benefits and challenges. Table 4.2 shows themes that participants highlighted that they encounter when providing mathematics intervention strategies.

Table 4.2: Themes

Theme 1	Theme 2	Theme 3	Theme 4
Teachers' perceptions about mathematics	Teachers' experiences regarding mathematics teaching and learning	intervention strategies applied to assist learners with diverse mathematics needs	Teachers' knowledge and skills and empowerment
Sub-themes	**Sub-themes**	**Sub-themes**	**Sub-themes**
-Benefits of maths	-attitude -teacher training and competence -learning environment	-Teaching methods and strategies	-supporting and empowering teachers

4.4.1 Perceptions

4.4.1.1 Benefits of mathematics

Participants 5, 9 and 11 indicated that they understood and appreciated the value of mathematics in people's lives (Naude & Meier, 2014). Participant 11 pointed out that the knowledge of mathematics made life easier. To show their understanding of the importance of mathematics, some participants highlighted how mathematics assisted them in performing other school duties such as handling school finances and school budgets. In addition, P4 indicated that knowledge of mathematics came in handy during organising of timetables, processing and analysing assessment data using South African Schools Administration and Management Systems. Two participants, one head of department(P3) and a deputy principal (P4) used their mathematics knowledge to compile assessment statistics that were submitted to the district office at the end of each term.

With regard to the importance of mathematics to learners, interviews revealed the following categories: child‘s intellectual development, child’s enjoyment of learning and child’s everyday usage of mathematics.

- Child’s intellectual development

Participants 9, 10 and 11 indicated that mathematics assisted learners to be creative, reason logically and think systematically. Learners follow correct procedures.

> P2: “*Mathematics challenges learners to think out of the box during mathematics lessons.”*

Mathematics assist learners with divergent and imaginative thinking. Mathematics helps learners articulate patterns and generalise their findings (DBE, 2011).

- Child’s enjoyment of learning

Participants 9, 10 and 11 from School C, indicated that mathematics provided enjoyment for learning, especially during problem-solving and mathematics puzzle. Completing tasks boosted learner confidence thereby encouraging them to experiment with concepts such as number patterns and shapes and to discover relationships among numbers for themselves.

> P9*: “As learners engage in mathematical games and excel in them they find joy in attempting more challenging problems.”*

- Child’s mathematics usage in everyday life

P1, 4,9 and 11 indicated the following as the benefits of mathematics in the learners’ everyday lives.

> P1:*“I like integrating mathematics and Life Skills. We do considerable counting forward and backwards during Performing Arts and Physical Education periods. When teaching Space and Shape, I ask learners to name shapes of objects around their communities.”*

P4:*"I teach Grade 6 Social Science and Mathematics. So, when doing data handling, I bring in Social Science activities. Learners collect and organise data in geography and history projects."*

P9:*"Learners love money but struggle with calculations. So, to try and make them understand, I make them play shop where they buy and get change or sell items to make profit. I try to make it interesting. We also engage in activities where we calculate the cost of things they use money on daily basis. They calculate how much food, transport or clothes cost."*

P11*: "With the concept time, I engage learners in calculating time spent at school, watching favourite television shows, sleeping, shopping and cooking or baking and when it comes to length, learners measure objects in the classroom and around the school. They then estimate the length and capacity of items in their households."*

In real life, mathematics is used in numerous ways including building, shopping, baking, transport (Christensen, 2017). In addition, The Times of India (2015), describes mathematics as the origin of all creation. Learners should be made aware of the constant presence of mathematics in their everyday lives.

Other participants viewed mathematics as a subject that assisted and enhanced learners' opportunities of attaining influential jobs. P5 indicated that learners who excel in mathematics usually find it easy to get bursaries to further their studies.

However, all participants pointed out that even though mathematics is important and provides benefits for both teachers and learners, teaching it and providing intervention and support for learners diverse needs was challenging because of various factors such as attitude towards mathematics, teacher training and competence, resources and learner-teacher ratios.

4.4.2 Teachers' experiences: Successes and challenges

As participants described their experiences, the following sub-themes emerged: attitudes, teaching strategies, behavioural problems, time, learning environment.

4.4.2.1 Attitude

Attitude consists of learned reaction which reflects one's positive or negative feelings and behaviour towards a situation (Ahmed, Sharma & Deppeler, 2012; Mkhize & Maistry, 2017). Learners' attitudes to mathematics are affected by their immediate environment which comprises of parents, teachers and peers(Austin, 2008; Farooq et al., 2011; Wainwright, 2011).

Participants 2, 3, 5, and 8 pointed out that learners, parents and educators' attitudes resulted in poor performance in mathematics by learners. Mathematics is seen or taken as very complicated and difficult school subject, therefore, mostly learners did not put any effort to acquire the necessary skills and knowledge.

- Learners

Participants 1, 5, 6 and 9 who teach the Foundation Phase Grades 1 and 2, indicated that learners displayed a positive attitude towards mathematics learning. They attributed this to the fact that learners used manipulative or concrete objects to work out their answers. Further, learners performed well in mathematics compared to languages.

However, participants who taught Grades 3–7 mathematics encountered challenges when teaching and providing support to learners. Most learners complained about mathematics tasks being too demanding. These learners did not put effort into acquiring mathematics knowledge and skills. Some learners, according to one of the participants from School A, who teaches Grade 7 asked why they should be learning mathematics. They did not see the importance of mathematics because some of their favourite celebrities did not have matric but were rich. Lack of interest in learning mathematics led learners to misbehave during lessons. Moreover, most learners did not do their mathematics homework at home but instead copied from their more capable peers. Some learners would not get assistance to complete their projects and homework from their parents.

- Parents

Children's home environments affected learners' attitudes towards mathematics learning especially in primary school (Wainwright, 2011). Parents' influence can either be positive or negative. If parents think mathematics is difficult, their children perform badly. Parents' positive attitudes tend to assist, support and motivate their children to like mathematics.

P7 indicated that other parents were fully involved in their children's mathematics homework activities while some parents were unable to do so. This was indicated by P1, 2, 5 and 8 from School A and School B. These participants indicated that upon being contacted by teachers, some parents would say they were not familiar with the way mathematics is taught nowadays despite the fact that teachers would have provided examples. Further, these participants felt that some parents were not doing their part. P11 highlighted the fact that there were some parents who wanted their children to excel in mathematics and ended up putting pressure on both the learner and the teacher.

- Educators

Teachers' beliefs develop learners' attitudes and emotions about mathematics learning (Wainwright, 2011). Research has shown that poor achievements by learners are related to teachers' poor quality of teaching (Farooq& Shah, 2008). Participants were interviewed with regard to teachers' attitudes towards mathematics teaching.

Participants 4, 7 and 11 who were teaching Grade 7 classes reported that content being taught was too challenging for the learners. In addition, one participant said that some educators did not apply themselves fully when teaching mathematics. Instead, they just copied examples from textbooks and wrote them on the board and did not explain the steps taken to get to the right solution. Other educators when approached by learners for assistance with mathematics projects told learners how difficult mathematics is. This affected how learners perceived mathematics. Learners have a more positive attitude towards mathematics when their teachers` attitudes are highly positive.

4.4.2.2 Teacher training

Teachers' training influences how they facilitate learning effectively (Zachary, Eleazar & Wilfred, 2016). Teachers are equipped with knowledge and skills that are necessary for them to be capable of teaching mathematics.

Participants had either attended college or university training. All participants indicated that they had done mathematics modules during their training. Out of the 11 participants, five had received training in providing mathematics learning support to learners during their university or college training. P4 from School A who indicated that she did not receive any mathematics learner support training at college mentioned that she attended all-inclusive education workshops conducted by the DBE during the term and during school holidays. P4, added that in 2017, during the June school holidays, she attended a week long intensive workshop on inclusive education which started at 8 a.m. and ended at 4 p.m. each day. The programme included supporting learners who have diverse mathematics needs.

P6 reported that methodology, strategies and mathematics procedures were not the same as those which were used when they were at university or college. They mentioned that there is a difference between what they learnt in college with what happens in class. P6 reported that he was not taught how to teach the actual content for each topic per grade and therefore struggled and found some teaching topics such as algebra and geometry for the Grade 7 class challenging. He expressed that he needed more support on how to teach these topics. P4 expressed the view that there was inadequate time to support learners because of his large class. This participant indicated that he had two Grade 7 classes and each class consisted of 53 learners.

P1, 2, 9,10 and 11 were familiar with mathematics requirements for assisting learners with diverse mathematics needs but carrying them out was a challenge. These participants mentioned that they covered inclusive education during teacher training. P10 revealed that inclusive education learning was now compulsory at teaching colleges and universities. P2 indicated that inclusive education equipped them with the necessary mathematics intervention strategies on supporting learners with diverse needs. However,

at the time of the interview, she was still learning how to put theory learnt at university into practice.

P9 revealed that she had yet to really practise supporting learners who struggle with mathematics since she had been an assistant teacher the previous year.

4.4.2.3 Teacher competence

Teachers' mathematics content knowledge and skills are key in facilitating effective instructions. Teachers' incompetence affects learners' performance (Wainwright, 2011). Teachers should be masters of their subject matter (Mahlo, 2017). Learners understand better when taught by teachers who are competent and knowledgeable.

P2 from School A, who taught Grade 3 in foundation phase, indicated that she could teach all the five mathematics topics namely number operations and relationships, patterns functions and algebra, space and shape, measurement and data handling. However, she found teaching of fractions challenging.

P2: "*Learners seem to get lost when its subtraction of mixed fractions*."

P4,8 and 11, who taught Grades 4–7 indicated that they did not have any problems teaching Grades 4–6. They found Grade 7 topics challenging especially exponents and algebra. Participants pointed out that they needed to learn the topics before they teach them. Moreover, participants indicated that they had not done mathematics during their high school years and college because it was not compulsory. One participant indicated that mathematics had not been offered at her school. This was attributed to the kind of education which was offered at that time (Bantu education). Upon being asked why they were teaching mathematics when they clearly did not feel comfortable, the interviewees indicated that there were shortages of competent teachers to teach Grade 7 mathematics in the school.

Participants 5–8 from School B were confident with their knowledge and skills with regard to teaching and offering support to learners with diverse mathematics learning needs. All participants from this school revealed that they were competent in teaching all topics

comprehensively. They also indicated that they had had learnt mathematics at school. The Grade 7 teacher indicated that he had majored in mathematics at college.

All participants from School C were fairly young. They were all in their twenties. During the interview, each participant showed enthusiasm towards mathematics. These participants indicated that they were competent. One participant who taught Grades 4–7 mathematics went on to tell the interviewer that she excelled in her mathematics modules at university level and produced her academic record. Participants in this school indicated that they were capable and competent.

4.4.2.4 Learning environment

A learning environment is a diverse physical space where learners learn through interaction and engagements (Bastanzhyieva, 2018). A learning environment facilitates meaningful learning (DBE, 2014b). For this to occur, (Waldman, 2016) suggested that learners should feel safe, engaged in learning, be connected and supported. Therefore, curriculum should be differentiated and teaching strategies varied to accommodate learners' diverse learning needs, teacher competence and appropriate attitudes. Therefore, teacher-learner ratio, time and learning resources are discussed below.

- Teacher-learner ratio

Teacher-learner ratio is higher in government schools compared to private schools according to a survey conducted by in 2017. Government schools in Gauteng have a ratio of 38:1 whereas private schools ranged between 17:1 and 32:1(Business Tech, 2018). P3 from School A indicated that at the beginning of 2020, they had more than 50 learners per class, up from 45. This means classes have 10 more learners than the prescribed 40:1 (SAHRC, 2012).

> P3:*" Overcrowding results in behavioural problems and a result as teachers we end up failing to attract learners attention for meaningful learning."*

Overcrowding had a great impact on how participants delivered their lessons. Seating arrangements of learners were affected, P6 reported. Further, this prevented teachers from offering individual attention to learners. Learners who needed assistance were not

attended to timeously. Teaching strategies that required group work were difficult to execute, P5 commented.

Participants in School C had smaller classes with a ratio of 1:15. The Grade 3 class had 28 learners and had two teachers, one class teacher and one teacher assistant. Participants mentioned that learners were attended to at all times.

Department of Education (2001), states that learners should be supported appropriately. Class sizes need to be small and manageable. This assists with time management.

- Time

Participants, especially the ones who teach mathematics to Grades 4–7 stated that more time was needed when teaching mathematics so as to explain, discuss and demonstrate all the steps and procedures fully. For learners who experience barriers to learning mathematics, one participant pointed out that

> P4*: "Learners have to begin at concrete level then representational level and finally abstract level and this requires enough time."*
>
> P8 added: *"Learners who struggle to grasp mathematical concepts need to progress at their own pace. They need to figure out solutions without being hurried."*

P6 revealed that lack of adequate time put learners and teachers under pressure and pointed out that the DBE requirements and time frames added to this pressure.

Participants 3, 4, 7 and 8 stated that they worked according to the Annual Teaching Plans (ATP) provided by the DBE. They mentioned that they found the ATPs helpful but they indicated that some teachers rushed through the content so as to meet the departmental time frames thereby neglecting learners who needed mathematical support. P7 expressed concern about what he termed "curriculum overload". He highlighted the multiple concepts that needed to be covered within a period of a week. Curriculum overload is when there is addition of new topics without removing other topics and changing requirements (Voogt & Nieveen, 2019). In addition, Majoni (2017), described curriculum overload as "a mismatch between capacity and load". Curriculum overload

could result in content not being taught effectively because of inadequate time. Moreover, too many topics to be taught and learnt leads to lack of concentration and loss of interest by learners. Teachers become frustrated and stressed (Rahman, 2009).

- Teaching and learning resources

Teaching and learning resources are materials used to facilitate learning (Kapur, 2019). In addition, Nsubuga (2009, cited in Bizimana & Orhodo, 2014) mentioned that teaching and learning resources include classrooms and textbooks. Therefore, teachers need physical tools to support their teaching as well as to create a conducive learning environment.

- Learning and teaching support materials

Learning and Teaching Support Materials (LSTM) are the different kinds of learning and teaching materials used for effective learning in the classroom (DBE, 2014b). The researcher analysed the availability of the A to School C. School A and School B were government schools while School C was a private school.

School A and School B

P1 and 2 from school A, and P5–6 from School B who taught in the foundation phase indicated that they had enough books, stationery and concrete objects to assist in their teaching and supporting learners. Participants who taught Foundation Phase were quite content with the resources available. However, their counterparts who taught Grades 4–7 indicated that they had text books but learners did not have all the required stationery. All participants indicated that technology was not used during mathematics lessons.

P4, who taught Grade 7 classes, pointed out that most Grade 7 "*Learners had no calculators and mathematical instrument sets."* She added that lack of this apparatus made it difficult to teach topics such as Exponents and Geometry.

School A, according to the participants, used to offer Mathletics which was done once a week by the computer teacher at the media centre. However, this programme could not continue because the computers were outdated and the school could not service them or

get new ones due to lack of funds. School B had yet to source tablets or laptops so that learners can use technology during mathematics and other subjects.

School C

According to the participants, the school supplied all the physical resources needed and parents brought extra resources if necessary. P9 showed the researcher some of the LTSMs. This school was fully resourced. Learners used technology more often. There were enough computers for each learner to have their own workstations.

- Classrooms

All three schools had enough classrooms. However, School A and School B had big classes which affected learning and teaching because of overcrowding. Some participants had this to say.

> P3:*" We are managing but I wish the tables were not too close to each other."*
>
> P7: " *I find it difficult to move around freely so as to offer support to learners who struggle."*

P2 from School A, who was teaching in the Foundation phase raised the issue of classroom furniture. She indicated that learners in Grade 1 use concrete objects when doing mathematics and required bigger tables. Tables that were being used at that time were small.

P9–11 from School C expressed satisfaction with regard to the size of classrooms. In addition, they indicated that the school had an average of 15 learners per class. Their classrooms had enough room for learners and teacher to move freely and even work on the floor if need be.

4.4.3 Intervention Strategies

4.4.3.1 Teaching methods and strategies

Participants 1–8 from School A and School B indicated an awareness of the new teaching methods which required them to be inclusive in their approaches during instruction. This meant that teachers should provide curriculum differentiation, multi-level teaching and

assessment, and learning activities that will accommodate diverse mathematics learners' learning needs (Dorgu, 2015; Marais, 2016). Participants acknowledged that learners have different levels of mathematics understanding, learn at different speeds and have their own learning styles. Therefore, differentiated instruction caters for the individual needs of the learner, whether struggling or the gifted (CIP Courses, 2019). Moreover, differentiated instruction provides for different learning styles (Layton, 2016) and provides flexible ways of grouping learners (Smale- Jacobse, Meijer, Helms-Lorenz & Maulana, 2019).

However, P3, 5 and 6 reported that it was difficult to offer differentiated learning and multi-level teaching since they were teaching mathematics the way they were taught. P3 revealed that he still used the whole class method(lecture method) because it saved time while others did not know how to execute multi-level teaching.

School C, which consisted of younger participants (P9–11) teaching in a private school, displayed a deep understanding of multi-level teaching. P9, 10 and 11 showed the interviewer their lesson plans which clearly showed what content was to be taught to which group and how it would be done. Each learner's needs, according to the lesson plan presented, would be met.

4.4.3.2 Teaching strategies

Participants from all the three schools were well aware of the teaching strategies that could assist learners improve performance and results in mathematics. The majority of the participants mentioned the following strategies they mostly utilise. These included cooperative learning, group learning, activity-based learning, scaffolding and individual learning.

- Cooperative learning

Cooperative learning promotes putting learners of different abilities in small groups where each group member has to contribute in completing a task (Landsburg et al., 2016). Learners cooperate in finding solutions to a given problem (Shafiuddin, 2010). The teachers' role in cooperative learning is to facilitate learning. In addition, cooperative

learning promotes teamwork, boosts learners' self-esteem, and encourages socialisation and good communication skills.

P9, 10 and 11 from School C highlighted that cooperative learning and group work entailed learners working in small groups and assisting each other.

> P10 commented: *"Cooperative learning promotes social and academic interaction, boosts learner's self-confidence because these learners contribute in group activities. As a result, this improves their academic results."*

P11 gave an example of a learner who never contributed during class discussions but participated during group tasks. Generally, participants stated that this strategy really worked and produced desired results, but participants from School A and School B pointed out that this strategy was difficult to implement because they found it to be time-consuming since they had big classes.

- Activity-based learning

Learning experiences should prepare learners for the real world. Activity-based learning affords learners that opportunity by engaging learners in active real-life learning (Eriyagama, 2018). Participants who engaged learners in small activity groups reported that every member of those groups participated fully. Learners found the learning experience exciting and learners' imaginations of the real world was captured (Landsburg et al., 2016), as learners were engaged in activities where they experimented and evaluated their learning experiences as reported by P2 and P10. P10, who taught in Foundation Phase in School C indicated that when teaching the concept of money, learners were taken to the tuck shop in small groups where they bought and received change. However, she said it was more meaningful to Grade 3s than to Grade 1s. Participants 1, 5 and 8 from School A and School B indicated that they used the activity-based learning strategy but minimally. They indicated that they used this strategy when giving homework activities to learners.

- Scaffolding

Scaffolding entails instructional temporary support offered by adults to learners that enables learners to solve problems beyond what they could have done without adult assistance (Mahan, 2020). All participants indicated that they employed this strategy to support their learners. However, P1–8 from School A and School B had challenges when administering this strategy to individual learners as a result of the big classes they had. These participants indicated that more time was needed to monitor learners' progress since scaffolding is support that is intended to cater for each learner's needs and is administered through gradual reduction in assistance (Pinantoan, 2013, Van De Pol, Mercer & Volman, 2019). Content is broken down into smaller units that are meant for learners to grasp (Landsburg et al., 2016). With scaffolding, teachers provide learners with manipulatives; learners move to the next stage once the first stage is mastered; and learners need individual support at various intensities. Scaffolding assists learners who experience dyscalculia and maths anxiety as learners get individual attention and are supported accordingly.

Class discussions create opportunities for learners to think critically (Witherspoon, Sykes &Bell, 2016) and learners are afforded authentic opportunities to voice their ideas (Khuzwayo & Bansilal, 2012). In addition, class discussions help learners share ideas with the teacher and fellow learners and, in the process, add to their knowledge and understanding of the matter being discussed (Corcoran, 2016). P11 from School C indicated that the class discussion method served as an introduction her for lessons. However, for the for rest of the lesson, learners worked in pairs or individually. Learners in this school usually used computers for their lessons. During the introduction, the teacher demonstrated how to solve mathematics problems, then used a video from the YouTube channel and other audio-visual learning channels to attract learners' attention. Then after that each learner worked on an activity which had been loaded on to their computers. Teachers moved around assisting those who required assistance. If there were more than one learner who needed assistance, she asked those who were done with their work to assist. Those not helping out, engaged in extension work. Participants

from School C emphasised the importance of the individual method. These participants indicated that the individual method assisted both the teacher and learner.

> P10: *"I attend to individual learners, identifying their strengths and weaknesses. I provide support to those require it."*
>
> P9: "*I get to bond with each individual the learner. This makes the learner to feel special and comfortable to work out their maths problems and the learner gets to work at their own pace."*
>
> P11: *"I'm of the opinion that the individual strategy makes learners feel valued and acknowledged and helps them to develop good self-esteem."*

During the interviews, the researcher realised that participants used different teaching strategies to teach. However, content taught was not differentiated to cater for the varying learners' mathematical needs. All learners were subjected to the same teaching methods and content. Learners who experience barriers to mathematics learning such as dyscalculia need to begin with content that is basic. Regardless of grade, concrete objects and representations are a necessity in acquiring mathematics skills.

- Assessment

Upon being interviewed about mathematics assessment, P1–8 from School A and School B in Foundation Phase revealed that assessment tasks were compiled by class teachers and moderated by their HODs while assessments for Intermediate and Senior Phase were compiled by mathematics teachers and moderated by HODs.

4.4.4 Support and Empowerment

Support is an integral part of the teaching and learning process. Support is practical or emotional assistance given to a person by a group of interconnected people (University at Buffalo, 2020). Therefore, for teachers to support learners effectively, a network of support that will mentor, coach and professionally develop them is needed (Nkambule & Amsterdam, 2018). Colleagues, the School Based Support Team (SBST), specialists like educational psychologists, the District Based Support Team (DBST) and parents should

work with the teachers to provide meaningful learner support. Working together, these stakeholders can improve learner performance in mathematics.

4.4.4.1 School support

Participants 1–4 from school A reported that their school had structures in place meant to assist mathematics educators in supporting learners of diverse learning needs. In the Foundation Phase section, educators assisted each other to design suitable activities to support learners. All Foundation Phase participants said they sometimes asked for assistance from the Learners with Special Educational Needs (LSEN) teacher who provided them with the appropriate content and ways of supporting their learners. One participant showed the interviewer differentiated CAPS documents for mathematics that the LSEN teacher had given her. The documents were of great value and importance to them. The LSEN teacher assisted participants and teachers in using the documents.

In the Intermediate Phase, mathematics teachers met for workshops whenever there was a need. Departmental workshops were conducted by the heads of department (HODs). However, teachers expressed their concern on the support given other hence

> P2 lamented*: "None of us are mathematics specialists and there are times when we all have to rely on Google for correct answers."*

School B and School C participants (P1–P8) indicated that they assisted each other in selecting appropriate content and designing learning materials for learners with diverse mathematics learning needs. The content and materials were then checked and moderated by the HODs before they were used by both the learners and teacher. One participant from School C indicated that there was a remedial teacher who came to assist teachers every now and then. Support was given topic by topic and should participants encounter any challenges on how to support learners, they could contact him at any time. All three participants from School C indicated that they found the assistance of this teacher to be a great relief.

P1–8 from School A and School B pointed out that if their meetings and workshops failed to yield the desired results, the SBST was approached to assist the individual teacher. Alternatively, workshops would be conducted for all mathematics teachers. If teachers

still needed assistance, then the DBST would be approached. The DBST was contacted to help with severe cases that needed specialist attention.

4.4.4.2 District support for teachers

The DBE through the DBST facilitates and support teaching, learning and assessment. This is achieved through the DBST screening, identifying, assessing learners' challenges and supporting both teachers and learners (DBE, 2014).

P1–8 from School A and School B attended termly workshops organised by the DBE at district level. P3 from School A highlighted how these workshops assisted them but wished the workshops could be allocated more time.

> P3*: "I wish that our termly workshops could be a whole day's workshop so that there could be demonstrations and for us to understand better and our questions have answered fully without rushing because of time."*

P1–8 expressed what they wished the department could provide them with and these included:

- More classrooms with fewer learners in class;
- Services of assistant teachers since each class had more than 50 learners. This was raised by the Grade 1 teachers;
- Computers in the form of desktops, laptops and tablets with a specialist who could workshop teachers on how to load teaching and support learning activities;
- Workshops to be conducted when teachers could still concentrate. Most district workshops were conducted after school and teachers would already be tired; therefore, concentration was not optimal;
- Have a resident mathematics specialist who could double as a remedial teacher in their respective schools;
- Have more workshops;
- The department to provide free-to-air mathematics learning channels on the South African Broadcasting Corporation television (SABC-TV) so that most learners can

access them since most educational programmes are currently found only on pay television stations. These programmes could be aired Monday to Friday.

4.4.4.3 Parental support

Parents play a pivotal role in their children's mathematics leaning. Parental support entails parents' engagement in their children's learning. Parents can assist their children by being involved directly or indirectly (Davadas & Lay, 2018). If parents are involved their children's learning, they will be able to offer support and motivation (Mahlo, 2017). P1–P8 from School A and School B indicated that some parents were supportive while others felt that their children's learning was solely the teachers' responsibility.

> P1*: "Supportive parents make appointments in order to find out how their children are performing in mathematics. They ask for advice on how they could help their children at home and some of these parents show that they know which topics or aspects of mathematics were problematic to their children."*

The above quotation from P1 suggests that these parents were hands-on and knew what was happening. In this group of supportive parents, P7 pointed out that some knew how to assist their children but others were not capable. Those who were unable but were financially stable enlisted the services of those institutions that could help learners. Some parents, who wanted their children to excel, pushed their children too hard and this resulted in these children developing mathematics anxiety. However, P8 reported that meaningful communication between parents and teachers in these schools benefited learners in the long-term. A positive communication between parents and teachers leads to learners' improvement in work ethics, academic performance and behaviour (Sheridan, 2018). It also leads to better social skills (Mathletics Team, 2016).

P3 and 5 mentioned that most parents who did not take responsibility for their children's learning always made excuses for not assisting their children with mathematics. These included;

- Insufficient time;
- They did not know how to assist learners;

- Lack of enough money to acquire the services of a specialist or other institutions which offer remedial lessons;
- They did not have the necessary resources;
- Assisting learners was the teachers' duty not theirs.

These parents seemingly did not see the importance of assisting their children to acquire the mathematics knowledge and skills. Interest was not shown. Therefore, P1–4 from School A pointed out that teachers and the school offered remedial mathematics lessons after school for an hour twice a week.

P9–11 from School C stated there was rapport between teachers of the school and parents. Parents were fully involved in their children's learning including mathematics.

> P9: *"Parents in this school are supportive. Mathematics is held* in high regard."
>
> P10: *"Parents take mathematics seriously. They want their children to master it. They enquire about their children's mathematics progress on a weekly basis and they always communicate through homework books for foundation phase and through diaries for intermediate and senior phase."*

P11 indicated that most parents whose children experienced mathematics learning difficulties enrolled their children at institutions like Kumon and Kip McGrath for extra help. Mathematics teachers also compiled support work in a form of booklets for all learners who struggled with mathematics concepts. Learners took booklets home and worked on them on a daily basis except on weekends. Parents signed these booklets on a daily basis.

4.4.4.3 Effectiveness of support provided to teachers

For teachers to be competent, they should be supported effectively. Loreman (2007) mentioned seven pillars to support teachers, namely, developing positive attitudes; supportive policy and leadership; school and classroom process; flexible pedagogical approaches; community involvement; meaningful reflection; and necessary training and resources. All participants revealed that they received support from various stakeholders.

All participants found support rendered to them to be empowering and made their work easier, although they had concerns about the availability of support from all stakeholders.

Some participants had this to say about the how they benefited from the support provided.

> P3: *"I am grateful for the support that I am getting from my colleagues and the District."*
> P4*: "The booklets that the LSEN teacher provided were so helpful. Step by step instructions were given. The booklets are so easy to follow and use."*
> P7: *"Workshops have helped me a lot."*

With regard to their concerns, participants were worried that their colleagues, the SBST and DBST were not readily available. For instance, peer teachers and the SBST had their own classes, where they taught, did administration work, assessed and supported learners who experienced barriers in their learning of mathematics; therefore, they were not always there to assist teachers who struggled to provide appropriate support to learners. The DBST offered their services to many other schools in the district and their assistance could not be accessed easily. This affected the effectiveness of their services. Participants mentioned that support was vital and needed to be accessed timeously for both the teachers and learners.

4.4.4.4 Learner performance after support

Participants experienced varying experiences regarding learners' performance after support. Some participants indicated that learners' performance improved remarkably while other participants revealed that some learners needed more support from teachers and specialists. In supporting the above sentiments:

> P11 stated: :"*It depends with the content being taught. Some learners excel in one topic and need support on the other. Learner X is so good in number patterns but has difficulty in calculating time in problem-solving."*
>
> P6 added: *"My learners percentage pass rate usually increases from what it is in Term 1. This means after learners receive support, their scores increase."*

P3 lamented: *"At times my interventions strategies work with [some] learners but not with others."*

P8 commented: *"So far so good. Learners are responding well to support strategies that I am providing."*

Collaboration of parents and schools could lead to positive and high performance by learners (Mata et al., 2012; Ntekane, 2018). P8 commented on how some gifted learners performed poorly due to social problems experienced at their homes such as abuse, bullying, witnessing violence at home and lack of enough food. Therefore, teachers needed to be attentive to learners' academic, social and emotional needs.

4.5 CHAPTER SUMMARY

The main purpose of this chapter was to analyse, interpret and discuss data collected through interviews. Each interview question was aimed at addressing the research topic. The themes that emerged along with sub-themes and categories revealed that primary school mathematics teachers need support in order to support learners who struggled with mathematics concepts.

The research findings exposed what could be the causes of poor mathematics performance by primary school learners. These included:

- Teachers' competence in curriculum differentiation in mathematics;
- Negative attitudes towards mathematics;
- Lack of motivation;
- Overcrowding in School A and School B;
- Work overload;
- Inadequate support such as in-service training;
- High teacher-learner ratios in School A and School B;
- Lack of interest in learning mathematics especially from Grades 4–7;
- Inadequate technology usage in teaching mathematics.

In spite of the highlighted challenges, participants were eager to improve learners' mathematics performance. Some participants were willing to attend workshops on

weekends so as to enable them to refine their mathematics knowledge and skills. It is apparent that teachers struggle with curriculum differentiation which is key to supporting learners who struggle with mathematics. Furthermore, it is evident that primary school mathematics teachers need support from all stakeholders. Parents should be encouraged to develop an interest and a positive attitude towards mathematics.

The next chapter summarises the findings of the research. Limitations of the study and conclusions which integrate the components of the study are provided. The chapter ends with recommendations for further studies.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter presents a summary of research findings, limitations that were encountered as the research progressed. Furthermore, this chapter provides conclusions on this research and highlights recommendations that may enhance teaching and learning of mathematics by learners with diverse needs.

5.2 SUMMARY OF CHAPTERS

Chapter 1 provided the background of the research study and outlined the problem statement and purpose of the research study which focused on finding out why primary school learners still perform poorly in mathematics. Attainment of democracy by South Africa in 1994 resulted in government terminating discrimination and exclusion in all departments including education. An inclusive approach which accommodated each learner regardless of race, ethnicity, language or any other barrier, the learning of any subject of choice including mathematics was introduced (DoE, 2001) and promoted human dignity and equality (DoE, 2001). However, learners' mathematics performance is still poor (Pournara at al., 2015; s.1.1; Roberts, 2017: s 1.1).

The study aimed at investigating and exploring primary school teachers mathematics' perceptions and experiences when teaching and providing intervention strategies to learners with diverse mathematics learning needs in three primary schools located in Johannesburg South District. The researcher needed to find out what factors impacted positively or negatively on the successful teaching and provision of mathematics intervention strategies by addressing the research question: **What are the teachers' experiences when teaching mathematics in primary schools?**

Chapter 2 reviewed literature that focused on primary school mathematics teaching and provision of intervention and support aimed at addressing the diverse learners' learning needs. Benefits of mathematics, teacher competencies, teaching strategies, attitudes and intervention and support needed to assist learners experiencing diverse learning needs were reviewed. Furthermore, challenges encountered in implementing mathematics at primary school were highlighted.

Chapter 3 provided details on the research methodology used to conduct the study. The researcher employed the phenomenological approach to collect information from the perspective of participants' lived experiences by conducting one-on-one interviews in three schools. The schools were labelled School A, School B and School C for anonymity, privacy and confidentiality purposes. Eleven primary school mathematics teachers participated in the open-ended interviews to reveal their perceptions and experiences in teaching and provision of intervention strategies.

In Chapter 4, data were interpreted and research findings about teachers' perceptions and experiences on teaching and providing intervention to the diverse needs of learners were presented. From the findings, it is evident that teachers have varying experiences regarding teaching and providing support in mathematics. The analysis revealed that teachers need a great deal of support so that they can be in a better position to teach and support learners effectively.

5.2.1 School A and School B

The two schools are state schools which are also former Model C schools which means that before 1994, these schools were predominantly attended by white learners. School A and School B were established in 1912 and 1952 respectively. Their buildings were standard. These schools accommodated learners from all races and some from other countries. Therefore, learners in these schools had multicultural backgrounds and were multilingual yet the Language of Learning and Teaching was English. Learners' socioeconomic backgrounds were mainly poor to middle class. The school staff were mainly government employees. The school staff included the principal, deputy principal, HODs, teachers, administrators and grounds assistants.

5.2.2 School C

This is a private school which was established in 2013. It is situated in one of the affluent suburbs in Johannesburg South. At the time of the research, the school admitted learners from all races. Learners' socioeconomic background was middle class (which included teachers, doctors, footballers, lawyers, bankers and wealthy company owners). The staff

at this school included the director (school owner), the principal, deputy principal, academic supervisor, heads of department, teachers and grounds assistants.

The schools used in this study served as a sample for the researcher to explore teachers' experiences and perceptions with regard to mathematics teaching and provision of intervention strategies to learners with diverse mathematics learners' learning needs. The different backgrounds of these schools offered the researcher an opportunity to learn how each participant from these schools employed teaching methods and teaching strategies and how attitudes by learners, parents and teachers hindered mathematics skills acquisition by learners. Furthermore, the researcher discovered how the availability of resources both human and physical impacted on their mathematics lesson delivery and how the different learning environments assisted in mathematics teaching and learning. Moreover, the researcher was able to ascertain how educators' training and teacher competence inhibited or assisted them in offering mathematics intervention strategies.

5.3 SUMMARY OF THE RESEARCH FINDINGS

From data collected, it is apparent how participants perceive mathematics and how it benefits learners and teachers. Further, it is evident that there are various factors influencing mathematics teaching and provision of intervention strategies to learners with diverse learning needs. These factors mostly are a hindrance to mathematics teaching and learning since they impact on both teachers and learners. Discussion findings are presented in relation to literature which was reviewed in Chapter 2 and themes such as perceptions, attitudes, teaching methods and strategies, teacher training, teacher competence and support, which emerged in Chapter 4.

5.3.1 Teachers' Perceptions

Mathematics is a beneficial subject as perceived by participants. Mathematics benefits everyone constantly and in many circumstances. Teachers and learners gain skills in problem-solving, technology progression and organisational skills. Furthermore, mathematics is taught for conceptual understanding, procedural fluency and strategic competence (DoE, 2011). Learners' intellectual development is enhanced and their self-esteem is boosted. The capability of solving mathematical problems brings joy to learners.

Teachers' administrative duties are made simple when their mathematics skills are up-to-date. To sum it up, Naude and Meier (2014) (s 1.6.2) perceived mathematics as a story of our everyday lives.

5.3.2 Attitude

Attitude towards mathematics affects the teaching and learning process of mathematics. (Farooq et al., 2011; s 2.7.3 and s 4.4.2). Teachers, learners and parents' attitude should be positive. In this study, other teachers showed enthusiasm about teaching mathematics while others indicated that they just taught mathematics because they had to. Other teachers showed less in interest therefore their attitude was less positive. Learners' attitude is related to their motivation (Mata et al., 2012; s 2.7.3; s 4.4.4). Therefore, learners need to be motivated at all times.

This motivation should be from their teachers and parents. Lack of interest and involvement in their children's mathematics learning by some parents from School A and School B led to their children's negative attitude towards mathematics. The negative attitudes towards mathematics cause recurrent failures, hinder learners intellect and curiosity, and reduce learners' self-esteem and interest in mathematics (Wainwright, 2011; s 2.8.3).

5.3.3 Teacher Training and Teacher Competence

All teachers were qualified to teach at primary school. However, some teachers were not trained to teach mathematics especially at Grades 4–7 levels. Training assists teachers to be competent in presenting lessons (Pournara et al., 2015; s 2.8.1). Competent teachers are usually effective and teachers' effectiveness is influenced by the context and conditions of where they are working (Pretorius, 2013; s 2.8.1). From the interviews conducted, lack of appropriate training affected these teachers' competence levels and attitude towards mathematics teaching and provision of support. Further, teachers who did their training through distance learning seemed to struggle with a number of issues such as selection of content and teaching activities. Teachers' mathematics knowledge is important (Pounara et al., 2015; s 2.8.1). Teachers should be adequately trained and professionally developed to be able to assist learners.

5.3.4 Learning Environment and Teaching Strategies

Teachers employed varying teaching methods and strategies in a bid to accommodate all learners. Mathematics content was differentiated to meet individual learners' diverse learning needs. However, the learning environment, which consisted of overcrowded classrooms and teacher-learner ratio of about 1:50 in School A School B were the major inhibitors of effective mathematics teaching and learning. The teachers' workload was huge. Teachers were forced to use the class discussion method more often thereby neglecting other teaching methods. Various teaching methods assist in the effective implementation of curriculum (Dorgu, 2015; Marais, 2016;s 2.8.2; s 4.4.3). Therefore, teachers need to vary their teaching methods. The class discussion method reduced the learner-to-learner interaction needed to support and learn from each other. Participants reported that individual attention was minimal.

5.3.5 Intervention Strategies and Support

For effective mathematics teaching and provision of intervention strategies, various levels and kinds of support should be provided as proposed by White Paper 6 when envisaging an inclusive education and training (DoE, 2001; s2.2.1).The Draft National Strategy on Screening, Identification, Assessment and Support (DBE, 2014; s 1.6.7; s 2.8) outlines the roles and responsibilities of teachers, learners, parents, SBST and DBST. The teacher has the role and responsibility of identifying the learners' diverse needs and implementing appropriate intervention strategies to support the learner. The teacher is key to the learner's learning according to Bronfenbrenner's bio-ecological model (Landsburg et al., 2016; S 3.2). In addition, Vygotsky suggested that teachers must attend to each learner's individual needs as no learner is without ability (Phasha & Condy, 2016; S 3.2). The teacher needs to work closely with families. Learners' learning is affected by their families. Families need to meet learners' needs according to Maslow's hierarchy of needs (Woolfolk, 2007; S 3.2).

Teachers in turn need to be supported should they encounter challenges during teaching and provision of support. The SBST provides support to the teacher at school level by supporting learners, teachers and providing curriculum interventions. If learners still

struggle with their learning even after the SBST interventions, learners are referred to the DBST and other support professionals. In this study, it is evident that teachers were not provided with adequate support by their SBST and DBST. The SBST consisted of teachers who also had to teach their own classes which o to be attended to at all times. The DBST in Johannesburg South services more than 50 schools. This makes it difficult for them to support schools timeously.

5.4 CONCLUSIONS

This research study explored and investigated perceptions and experiences of primary school mathematics teachers when teaching and providing intervention strategies to learners who experience diverse mathematics learning needs. Three primary schools in the Johannesburg South District were selected (Two government schools and one private school). The aim of the research was to discover and establish factors that cause low performance in mathematics. Interviews were conducted, data interpreted and findings emerged. Teacher competence, teaching methodology, teaching strategies and attitudes influence how learners acquire mathematics knowledge and skills. It is imperative that teachers are empowered and supported so as to teach and provide appropriate and timeous support to learners with diverse mathematics learning needs.

It can be concluded that all participants regarded mathematics as a valuable subject. Participants highlighted some benefits of mathematics to both the teacher and learner at school and in their everyday lives. The participants' experiences of teaching mathematics vary. In addition, participants were concerned about the negative attitudes that were displayed by some parents and learners. It could be concluded that teachers' attitudes towards mathematics were positive for some and indifferent for others.

For teacher training and professional development, it is evident that some participants never received training in effective mathematics teaching and support when they were attending university or college. The workshops they attend are insufficient as they take place on few occasions and do not cover all that needs to be taught. Further, teachers often teach mathematics by default if there are no mathematics qualified teachers at the schools.

School A and School B are state schools which are not fully resourced. Some lack LTSMs; they do not have advanced mathematics technology; desks for learners are very small; and class infrastructure is limited which contributes to overcrowding. On the other hand, the private school is well resourced, from staffing to classrooms, technology and specialist services.

For intervention strategies and support, it could be concluded that:

- Some participants are not competent in using the different teaching methods and techniques to support learners, therefore, need to be supported.
- Participants from School A and School B encounter challenges when employing some teaching strategies due to overcrowding and inadequate resources.
- School A and School B should have the use of technology as an integral part of teaching and learning.

5.5 LIMITATIONS OF THE STUDY

There are limitations in this study that may affect the credibility of the study. These include the sample size and selection and some unforeseen circumstances such as the 2020 Corona Virus pandemic.

The study was carried in only three schools in Johannesburg South District. School A and School B are state owned schools which are both situated in the same suburb and are 500 metres apart. In addition, one participant pulled out due to personal reasons. Moreover, the researcher need to resort to conducting telephone interviews with three participants who were scheduled to be interviewed at the beginning of April. This was due to the national lockdown caused by the prevalence of the COVID 19 pandemic. Therefore, these could be limiting factors in the generalisations of findings. The results of the study cannot be generalised to other schools in South Africa or other countries regarding mathematics teaching and provision of intervention strategies to diverse learners' learning needs.

However, this did not affect the credibility of the study. The 11 participants that were interviewed were information-rich and experienced in the phenomenon being studied. The

data collected was thoroughly and carefully analysed. The researcher is confident that the research purpose has been achieved.

5.6 RECOMMENDATIONS

After an enriching and educative research experience, a number of recommendations emanating from this study are suggested to ensure that mathematics teaching, learning and provision of intervention strategies yield improved mathematics performance.

5.6.1 Teacher Training and Development

- Upon investigation, newly qualified teachers who did their teaching courses through distance learning indicated they needed more support since they did not have the opportunity to be practice for long in school environment. For distance learning to be successful, there should be effective student support systems in place. Therefore, all universities should make sure that student teachers are supported effectively during their teaching practice. In addition, student teachers should spend more time practising in schools. Mathematics requires competent teachers. In addition, teachers should be equipped with the use of technology in the classroom and in distance learning and teaching.
- Teacher training of mathematics should be compulsory for junior degrees and diplomas, and teachers should thereafter receive regular professional development. Teachers should attend meaningful workshops. Furthermore, teachers should be assisted to apply curriculum differentiation.

5.6.2 Support

- At school level, the SBST's role is to review teachers' support plans and individual support programmes for learners who have diverse learning needs (DBE, 2014). Therefore, I recommend that this team should have fewer teaching periods and have more time to support educators to develop comprehensive teaching strategies, appropriate support content and individual support programmes.
- The DBE should provide more mathematics subject advisors to visit schools regularly for the purpose of monitoring and supporting teachers in delivering meaningful

mathematics lessons. This is one of the roles of subject advisors as gazetted by the DBE (2012). At the moment, participants attend workshops once a term which last only one or two hours.

5.6.3 Resources

The DBE should provide adequate technological, physical and human resources to promote the vision of inclusive education.

5.6.3.1 Physical resources

School A and School B just like other government schools, still have inadequate infrastructure (SABC News 2019; West &Meier, 2020). More classrooms should be built in to avoid overcrowding. Information and Communication Technology should be an integral part of mathematics learning as envisaged by the White Paper on e-Education (DoE, 2004).The COVID 19 pandemic has revealed that technology is a vital part of Teaching and Learning (Mahaye, 2020; Jantjies & Joy, 2016).The DBE and partners should supply technological resources including its connectivity to all learners including those who are in remote rural areas.

5.6.3.2 Human resources

The DBE should employ teachers who possess the appropriate mathematics qualifications which will enable effective mathematics teaching and learning. School A and School B could approach the Gauteng Department of Education's Extra School Support Programme which was established in 2011.

5.6.4 Parental involvement

Schools should create relationships with parents through communication that is clear, regular and effective. Parents should be informed and empowered on new ways of solving mathematical problems through conducting workshops or meetings. Parents who are illiterate could get opportunities of attending mathematics classes if they wish to do so. This will enable parents to assist their children with mathematics homework and projects. Parental involvement in children's mathematics activities will create a positive attitude in learners.

5.7 SUGGESTIONS FOR FURTHER STUDY

Assessment of mathematics was not fully explored. There is a need for further research that will investigate how primary school mathematics learners who have diverse learning needs are assessed. In addition, research can be conducted to examine how mathematics is taught in secondary schools and how learners are supported.

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APPENDIX A: ETHICAL CLEARANCE

UNISA university of south africa

UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2019/10/16

Ref: **2019/10/16/44132441/05/MC**
Name: Mrs P Gora
Student No.: 44132441

Dear Mrs Gora

Decision: Ethics Approval from 2019/10/16 to 2022/10/16

Researcher(s): Name: Mrs P Gora
E-mail address: nyathipromisefirstname@yahoo.com
Telephone: +27 73 285 2219

Supervisor(s): Name: Prof MO Maguvhe
E-mail address: maguvmo@unisa.ac.za
Telephone: +27 12 481 2768

Title of research:

Experiences of primary school teachers in teaching mathematics and provision of intervention strategies to diverse learners (A case of Johannesburg South District)

Qualification: M. Ed in Inclusive Education

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above mentioned research. Ethics approval is granted for the period 2019/10/16 to 2022/10/16.

*The **low risk** application was reviewed by the Ethics Review Committee on 2019/10/16 in compliance with the UNISA Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the UNISA College of Education Ethics Review Committee.

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
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3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
7. No field work activities may continue after the expiry date **2022/10/16**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number **2019/10/16/44132441/05/MC** *should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Kind regards,

Prof AT Motlhabane
CHAIRPERSON: CEDU RERC
motlhat@unisa.ac.za

Prof PM Sebate
ACTING EXECUTIVE DEAN
Sebatpm@unisa.ac.za

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APPENDIX B: PERMISSION REQUESTED FROM THE DEPARTMENT OF EDUCATION

College of Education
P.O. Box 392
UNISA
0003, Pretoria
R.S.A

REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN SCHOOLS IN JOHANNESBURG SOUTH DISTRICT.

Experience of primary school teachers in teaching Mathematics and provision of intervention strategies for diverse learners (A case of Johannesburg South District)

Date: 26 August 2019

Deneo Kgetsane

Gauteng Department of Education
Telephone (: 011 355 0336
Email: dineo.kgatsane@gauteng.gov.za

Dear Mrs. Dineo Kgetsane

I, Promise am doing research under supervision of Professor Maguvhe in the Department of Inclusive Education towards a Master's of Education Degree (MED) at the University of South Africa. We request permission to conduct a study entitled **Experience of primary school teachers in teaching mathematics and provision of intervention strategies to support diverse learners (A Case of Johannesburg South District).**

The aim of this study is to explore and establish the teacher's views and experience when teaching and providing support to learners who experience mathematics barriers to learning.

The study will require 12 Teachers from three schools (Four teachers per school) to share their experiences of mathematics teaching in the primary school.

Teachers will be required to participate in approximately 15-20 minutes interviews. Teachers will be assured that their personal information such as names will not be

recorded anywhere and that no one will connect them to the information produced during the interview. Codes or pseudonyms will be used in all data, publications, conference proceedings, or research reporting. Teachers participation will be voluntary and under no circumstances will they be obliged to consent to participation, should they decide to participate, they decide to participate, they will be given information sheet to keep and will sign a consent form. Teachers will be free to withdraw from the research at any time without giving any reason.

The benefits of this study are that teachers will get to share their experiences with regards to teaching and providing support in mathematics. Potential risks are very low as no-sensitive information will be shared.

There will be no reimbursement or any incentives for participation in the research. Feedback procedure to participation will be in the form of copies of research findings provided by the researcher upon participant's request.

Yours Sincerely

P.Gora

_____

Promise Gora
M.Ed Student at UNISA

APPENDIX C: PERMISSION GRANTED BY DEPARTMENT OF EDUCATION

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

8/4/4/1/2

GDE RESEARCH APPROVAL LETTER

Date:	26 February 2020
Validity of Research Approval:	04 February 2020 – 30 September 2020 2019/418
Name of Researcher:	GORA P
Address of Researcher:	5 Frieda Street
	Regents Park
	The Hill, Johannesburg, 2197
Telephone Number:	*073 285 2219*
Email address:	nyathipromisefirstname@yahoo.com
Research Topic:	Experiences of Primary school teachers in teaching Mathematics and provision of intervention strategies to diverse learners (A case of Johannesburg South District).
Type of qualification	Masters of Education
Number and type of schools:	Four Primary Schools
District/s/HO	Johannesburg South

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

26/02/2020

1

Making education a societal priority

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
Email: Faith.Tshabalala@gauteng.gov.za
Website: www.education.gpg.gov.za

1. *Letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.*
2. *The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.*
3. *A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s have been granted permission from the Gauteng Department of Education to conduct the research study.*
4. *A letter / document that outline the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs and District/Head Office Senior Managers of the schools and districts/offices concerned, respectively.*
5. *The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, and chairpersons of the SGBs, teachers and learners involved. Persons who offer their co-operation will not receive additional remuneration from the Department while those that opt not to participate will not be penalised in any way.*
6. *Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.*
7. *Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.*
8. *Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.*
9. *It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.*
10. *The researcher is responsible for supplying and utilising his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources.*
11. *The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.*
12. *On completion of the study the researcher/s must supply the Director: Knowledge Management & Research with one Hard Cover bound and an electronic copy of the research.*
13. *The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned.*
14. *Should the researcher have been involved with research at a school and/or a district/head office level, the Director concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.*

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards

Mr Gumani Mukatuni
Acting CES: Education Research and Knowledge Management

DATE: 26/02/2020

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
Email: Faith.Tshabalala@gauteng.gov.za
Website: www.education.gpg.gov.za

APPENDIX D: PERMISSION REQUEST LETTER TO THE PRINCIPAL

College of Education
P.O Box 392
UNISA
0003, Pretoria

Date: 26 August 2019

Dear Principal,

I, Promise, am doing research under supervision of Professor Maguvhe in the Department of Inclusive Education towards a Masters of Education Degree (M.Ed) at the University of South Africa.

We are inviting teachers at your school to participate in a study entitled **Experience of Primary Teachers in Teaching Mathematics and provision of intervention strategies to support diverse Learners (A Case of Johannesburg South District)**.
This study is expected to collect important information that could benefit teachers on how to include learners who struggle in mathematics.

The study will require 12 Teachers from three schools (Four teachers per school) to share their experiences of mathematics teaching in the primary school.

Teachers will be asked to respond to questions about their experiences when teaching mathematics in their classrooms. The researcher wishes to clarify that participation in this study is voluntary and teachers are under no obligation to consent to participation. If teachers do decide to take part, they will be given this information sheet to keep and be asked to sign a written consent form. Teachers are free to withdraw at any time and without giving a reason. By participating in this study, teachers will share their experiences when teaching mathematics in their classrooms. Benefits may include teacher's personal development and preparing pre-service teachers for teaching learners with special needs in a mainstream classroom. The study does not pose any potential harm or injury to teachers since all information gathered will be anonymous and kept with strict confidentiality.

There is no anticipated inconvenience, as interviews will be scheduled at teacher's convenience. Teachers' names will not be recorded nowhere and no one will be able to connect to them to the answers they give. All answers will be coded and teachers will be referred by a code in the data, any publications or conference proceedings. The research report may be identifiable in these processes. Records that identify teachers will be available only to people working on the study, unless teachers give written permission for other people to view the records.

The researcher will store hard copies of teachers' answers in a secured lockable steel cabinet and soft copies of the data will be stored in a password-protected computer for future research or academic purposes for the next five years. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. After the five-year period elapses, hard copies will be shredded and short copies permanently deleted from the computer hard drive using appropriate software.

Teachers will not receive any payment or financial rewards for participation in this study. If you would like to be informed of the final research findings, please contact Promise Gora on +27 73 285 2219 or nyathipromisefirstname@yahoo.com. The findings will be accessible for as long as you wish. Should you require any further information or have concerns about the way in which the research has been conducted, you may contact Professor M.O. Maguvhe on +27 12 481 2768 or magvmo@unisa.ac.za.

Thank you for following the teachers to participate in this study.

Yours Sincerely

P. Gora

_____

Promise Gora
M.Ed Student at UNISA

Prof. M.O. Maguvhe

_____

Professor M.O. Maguvhe
SUPERVISOR

APPENDIX E: PARTICIPANT INFORMATION SHEET

College of Education
P.O Box 392
UNISA
0003, Pretoria
R.S.A

PARTICIPANT INFORMATION SHEET

Date: 26 August 2019

Title: Experiences of primary teachers in teaching mathematics and provision of intervention strategies and support to diverse learners (A case of Johannesburg South District)

Dear Prospective Participant

My name is Promise Gora and I am doing a research under the supervision of professor Maguvhe, a professor in the Department of Inclusive Education towards a Master's Degree in Education MED) Degree at The University of South Africa.

We invite you to participate in the study entitled **Experience of primary school in teaching materials and provision of intervention strategies to diverse learners (A Case of Johannesburg South District)**

WHAT IS THE PURPOSE OF THE STUDY?

This study is expected to collect information that could benefit teachers on how to support leaners who struggle in Mathematics in primary school.

WHY AM I INVITED TO PARTICIPATE?

You are invited because you teach Mathematics therefore you are in a biter position to share your experiences of teaching this subject.

WHAT IS THE NATURE OF PARTICIPATION IN THE STUDY?

The study will 12 teachers from three primary schools. Each participant will last 15-20 minutes. The interviews will be recorded with your permission. The interview questions will be about your experiences in teaching mathematics at primary.

Your participation in the study is voluntary and you are no obligation to consent to participation. If you decide to participate, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason. By participating in this study, you will share your experiences about teaching Mathematics and providing support to teachers who have Mathematics difficulties.

WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?

Benefits may include personal and professional development as well as preparing pre-service teachers for teaching mathematics in primary schools.

ARE THERE ANY NEGATIVE CONSEQUENCES FOR ME IF I PARTICIPATE IN THE RESEARCH PROJECT?

The study does not pose any potential harm or injury to you or other participants since all the information gathered well will be anonymous and confidential. There is no anticipated inconvenience, as interviews will be scheduled at your convenience. Your name will not be recorded anywhere and no one will link you to the responses you give during the interviews. Your answers will be coded and you will be referred by code in the data, any publications or conference proceedings. The research report may be submitted for

publication in a journal or the results presented at a conference but individual participants will not be identifiable in the processes. Records that identify you will be available on to people working on the study, unless you give written permission for other people to view the records.

HOW WILL THE RESEARCHER PROTECT THE SECURITY OF DATA?

The researcher will store the hard copies of your answers in a secured lockable steel cabinet and soft copies of the data will be stored in personal password-protected computer for future or academic purposes for the next five years. Future use of the stored data will be subject to further ethics review and hard copies will be shredded and soft copies will be permanently deleted from the computer hard drive using appropriate software.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?

You will not receive any payment or financial rewards for participating in this study.

HOW WILL I BE INFORMED OF THE FINDING RESULT OF THE RESEARCH?

If you would like to be informed of the final research findings, please contact Promise Gora on +27 73 285 2219 or 44132441@mylife.unisa.ac.za. The findings will be accessible as long as you wish. Should you require any further information or have concern about the way in which the research has been conducted, you may contact Professor M.O. Maguvhe on +27 12 481 2768 or maguvmo@unisa.ac.za.

Thank you for taking part to read this information sheet and participating in this study.

P.Gora

_____

Promise Gora
M.Ed Student at UNISA

Prof. M.O. Maguvhe

_____

Professor M.O. Maguvhe
SUPERVISOR

APPENDIX F: CONSENT LETTERS (RETURN SLIPS)

College of Education
P.O. Box 392
UNISA
0003, Pretoria
R.S.A

CONSENT TO PARTICIPATE IN THE STUDY (Return Slip)

I _____ (Participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation. I have read (or had explained to me) and understood the study as explained in the information sheet. I have had sufficient opportunity to ask questions and I am prepared to participate in the study. I understand that I am free to withdraw at any time without penalty.

I am aware from that the findings of the study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the interview proceedings.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname_____

_____ _____
Participant Signature Date

APPENDIX G: INTERVIEW GUIDE

College of Education
P.O. Box 392
UNISA
0003, Pretoria

Topic of the research**: Experience of primary school teachers in teaching mathematics and provision of intervention strategies to diverse learners. (A case of Johannesburg South District)**

- How would you describe your teaching experience of Mathematics (the benefits or advantages and the challenges)?
- In your opinion, what makes learners perform poorly in Mathematics?
- How has your teacher training prepared you in teaching Mathematics?
- Describe the support available for teachers who teach Mathematics receive from school, district or the province.
- Is this support improving learner's performance in Mathematics? Elaborate.

APPENDIX H: CONFIRMATION OF PROFESSIONAL EDITING

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5 July 2021

Declaration of professional edit

EXPERIENCES OF PRIMARY SCHOOL TEACHERS IN TEACHING MATHEMATICS AND PROVISION OF INTERVENTION STRATEGIES TO DIVERSE LEARNERS(A CASE OF JOHANNESBURG SOUTH DISTRICT)
by

PROMISE GORA

I declare that I have edited and proofread this thesis. My involvement was restricted to language usage and spelling, completeness and consistency and referencing style. I did no structural re-writing of the content.

I am qualified to have done such editing, being in possession of a Bachelor's degree with a major in English, having taught English to matriculation, and having a Certificate in Copy Editing from the University of Cape Town. I have edited more than 200 Masters and Doctoral theses, as well as articles, books and reports.

As the copy editor, I am not responsible for detecting, or removing, passages in the document that closely resemble other texts and could thus be viewed as plagiarism. I am not accountable for any changes made to this document by the author or any other party subsequent to the date of this declaration.

Sincerely,

Dr J Baumgardt
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University of Cape Town: Certificate in Copy Editing
University of Cape Town: Certificate in Corporate Coaching

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Full Member

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