

**CHALLENGES IN TEACHING LEARNERS EXPERIENCING
BARRIERS IN MATHEMATICS AT THE INTERMEDIATE PHASE:
TSHWANE SOUTH DISTRICT**

by

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DECLARATION

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I declare that “CHALLENGES IN TEACHING LEARNERS EXPERIENCING BARRIERS IN MATHEMATICS AT THE INTERMEDIATE PHASE: TSHWANE SOUTH DISTRICT” is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

SIGNATURE
(Mr)

DATE

DEDICATION

This work is dedicated to God almighty who said in his word that “if you need wisdom, ask our generous God, and he will give it to you. He will not rebuke you for asking.” (James 1 vs. 5 NTL version).

And to my late parents (Pa and Mrs Daniyan) who led me in God’s way.

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ABSTRACT

This study investigates the challenges in teaching learners experiencing barriers in mathematics at the intermediate phase in Tshwane South District. Relevant literature review reveals that teachers' inadequate training and lack of supportive structure hinders their pedagogy, resulting in demoralisation, frustration, and a sense of inadequacy. Nonetheless it is teachers' responsibility to make learning happen; the inclusive educational policy maintains that teachers are the prime engine of realizing educational goals. They are to support and accommodate diverse learners and meet their needs (Department of Education [DoE], 2001). In situations where contradicting factors wrestle and contend with pedagogy practice actualizing the desire goal of including and supporting all will be difficult.

The study was conducted within the qualitative paradigm; specifically case study design was employed. Ten teachers were interviewed from five different settings. An inductive analysis method was used to analyze data.

Findings of the study indicate various challenges in teaching learners experiencing barriers in mathematics. The findings revealed issues related to education such as: language barriers, overcrowded classes, the Gauteng Primary Language and Mathematic Strategies (GPLMS), lack of resource materials. Learners and teachers factors influencing mathematics teaching and availability of support strategies to enable teachers to assist learners experiencing barriers. The study recommends that GPLMS should be revised to make proper allowance for learners experiencing barriers, inculcation of English language at the foundational phase, proper training of teachers for Screening, Identification, Assessment and Support (SIAS) implementation and hiring of relevant personnel to teach mathematics at foundational phase.

KEY WORDS: Teachers, teaching challenges, barriers to learning, learners, mathematics, intermediate phase, Tshwane.

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LIST OF ABBREVIATIONS AND ACRONYMS

ADHD	Attention deficit hyperactivity disorder
ACARA	Australian curriculum, assessment and reporting authority
ANA:	Annual National Assessment
ASCD	Association for supervision and curriculum development
BICS	Basic interpersonal communication skills
C2005	Curriculum 2005
CAPS	Curriculum Assessment Policy Statement
CALP	Cognitive academic language proficiency
CREATE	Consortium for Research on Educational Access, Transitions and Equity
DBST	District Based Support Team
DoE	Department of Education
EFA	Education for All
ELL	English language learners
ESOL	English Second or Other Language
FAL	First additional language
FET	Further Education and Training
GET	General Education and Training
GPLMS	Gauteng Primary Language and Mathematic Strategies
HE	Higher Education
HOD	Head of Department
ILST	Institutional Based Support Team

ISP	Individual support plans
MEC	Member of the executive council
NCLB	No child left behind
NCS	National Curriculum Statement
NCTM	National Council of Teachers of Mathematics
NEA	National Education Association
OBE	Outcome based education
RSA	Republic of South Africa
SBST	School Based Support Team
SES	Socio-economic status
SGB	School Governing Body
SIAS	Strategy on Screening Identification Assessment and Support
TIMSS	Trends in International Mathematics and Science study
UNESCO	United Nations Educational, Scientific, and Cultural Organization.

CHAPTER 1 : INTRODUCTION

1.1 INTRODUCTION

“The best thing about the mathematics classroom is that when our teacher enters, hundreds of sparkling numbers tumble down from the ceiling and then disappear as they hit the floor. And all of us scurry around clutching a net in our hands, trying to catch them. If you’re quick enough, you might find you’ve caught the golden number which gives you the answer to that day’s homework.” (Jale, 9, in Hancock, Collins, and Stacey, 2013: 73).

The quotation above and many other related words expressed by learners reflect how they perceive mathematics teachings. This situation has attracted great concern regarding teachers’ pedagogy practices. Facilitation and motivation of learners to develop their interest for mathematics in order to improve their skills and performances is an issue that has dominated the educational arena for years. This has prompted various education experts, education organisation and governments worldwide to develop policies and strategies to address issues of mathematics teaching. Examples of such initiatives are: Association for Supervision and Curriculum Development (ASCD), National Council of Teachers of Mathematics (NCTM), the No Child Left Behind (NCLB) act, the Australian Curriculum, Assessment and Reporting Authority (ACARA).

In the South Africa context, curricular reforms, policies and strategies such as Outcome Based Education (OBE), National Curriculum Statement (NCS), Gauteng Primary Language and Mathematic Strategies (GPLMS), Curriculum Assessment Policy Statement (CAPS) were developed to improve and promote quality in various subjects including mathematics.

In the meantime the pedagogical practice of mathematics continues to experience challenges which cannot be quantified; this is compounded when teachers deal with learners facing barriers in the subject. As stated by Fleisch (in Venkat 2012: 107) substantial proofs from recent studies indicate that teaching and learning of mathematics in South Africa has severe problems.

Adler and Jaworski (in Adler & Reed 2002: 3) acknowledged that teaching is full of complexity, a practice filled with pressure. This concurs with Van Zyl and Pietersen (in Engelbrecht, Oswald, Swart & Eloff 2003: 294) state that South African teachers are working under stress. Factors that contribute to their stress according to them include inadequate working conditions, inadequate salaries, time pressure, the problem learners pose to them, their non-involvement in decision-

making relating to their job, the low esteem accorded to their profession. Prinsloo (in Mpya 2007: 83) states that lack of teachers' competency to understand and help learners' results in a situation of demoralisation, frustration, and sense of inadequacy. Engelbrecht, Green, Naicker and Engelbrecht (2007: 157) are of the view that most teachers feel inadequately trained and lack support to meet the numerous challenges facing them in classes and in the school as a whole. Irrespective of these, the Educational White Paper 6 (DoE, 2001) compounded the situation by demanding that teachers must accommodate and provide for a diverse range of learning needs.

This situation placed teachers under duress in the classroom especially when they have to deal with barriers to learning and manage diversity. These challenges are more pronounced in remote and some township schools where the availability of resources are limited or totally absent coupled with widespread socio-economic ills. As Rembe (2012: 12) indicates, the major challenge for education post-apartheid was to overcome inequities in terms of provision of education between the poor and rich schools.

The Education White Paper 6 makes it clear that our constitutional responsibility is to ensure that all learners are educated (Gasa, 2011: 5). The policy also maintained that learners who experience barriers to learning should participate fully as school community members and should be provided with quality education through effective teaching and given the necessary support (Landsberg, Kruger & Swart, 2011: 75). Equally the South Africa Constitution (Republic of South Africa [RSA], 1996) stipulates that every person has the right to basic education and training which the state is obliged to provide and make accessible to all. However, accessibility and provision of quality education from the teaching angle have been hampered due to various challenges teachers experience during pedagogical practice and this is more conspicuous when teaching mathematics to learners experiencing barriers in the subject. Teaching learners experiencing barriers in mathematics in the absence of professional development, support and resource materials is unproductive. Teachers need to be equipped in order to address barriers to learning. Wildeman and Lefko-evrett (in Rembe, 2012: 12) observe that the policy of inclusion will usually necessitate infrastructure expansion and staff enrichment normally lacks the backing of adequate resources. Engelbrecht et al. (2007: 157) maintain that support of teachers is crucial given their progressively challenging roles within the school. All-encompassing support is required for a teacher to be productive in the classroom. In the light of the above contextual annotation, this study sought to investigate challenges in teaching mathematics to learners experiencing barriers.

1.2 BACKGROUND TO THE STUDY

Dickey (1997: 1) observed that present day mathematics teachers are faced with a challenging situation due to changes in mathematics contents and ways of teaching the subject. The paradigm shift to a heutagogical approach which shifts the focus from teachers to learners, coupled with the shift in mathematics contents, is cumbersome. Van de Walle (2004) notes that the concepts and procedures of teaching mathematics are now sophisticated, it entail more than the previous traditional computation skills. Reys, Lindquist, Lambdin, Smith, Rogers, Falle, Frid and Bennett (2012: 49) observe that current teaching is no longer teacher focused but learners are engage actively in the teaching and learning process, where teacher involves them in class activities and discussion.

According to Reys et al. (2012: 37) present day mathematics teachers have the responsibility of teaching new concepts and topics in a manner different to the way they were taught in elementary school. In addition, the inclusive system demands teachers adapt teaching and classroom resources to accommodate the different needs of heterogeneous learners. The Salamanca conference acknowledged that individual children exhibit distinct traits, abilities, learning needs and interests, and education should be planned to consider this diversity (Landsberg & Gericke, 2006: 19). The Education White Paper 6 (DoE, 2001) recognises that a wide range of learning needs occurs among the learner populace at any point in time, and learners may fail to learn successfully or be excluded from learning systems in a situation where these needs are not met. The onus of meeting these needs rests on teachers. In the words of the Education White Paper 6 (DoE, 2001), "Classroom educators will be our prime resource for realizing our goal of an inclusive education and training system". However, provision of quality education to learners to meet these demands has being hampered by various factors, especially when teaching learners experiencing barriers in mathematics.

In general, government has the responsibility of making quality education accessible for learners in order to meet the challenges of change (Du Plessis, 2013: 53). This responsibility is executed and made possible by teachers, because, as stated by Engelbrecht, Green, Naicker and Engelbrecht (2007: 129), teachers make learning possible. Ozola and Purvins (2013: 137) concur, claiming that the aim of teaching is to make learning possible for the students. These authors further argue that the learning management is determined by the skill possessed by teachers and their pool of teaching-learning methods in producing learning experiences. Teacher skill in choosing relevant strategy is crucial in the management of barriers to learning.

However, inadequate teacher knowledge of subject contents is a notable challenge experienced in pedagogic practice globally, and can be traced back to the educational training most of them

received (Awuor, 2013; Lemmer & Van Wyk, 2010; Gordon, 1989; Reddy, Van der Berg, van Rensburg, & Taylor, 2011; Berns & Swanson, 2000: 14). In the South African context, for instance, the provision of education in the previous dispensation was fragmented and characterised by inequality and disparity (Lemmer & Van Wyk, 2010: 247). Gordon (1989: 10) pointed out that low quality training which is deeply entrenched in inadequate education leads to poor conceptual understanding of mathematics. Adler and Reed (2002) added that South Africa education was long characterised in terms of inequality, inefficiency, administrative control of curriculum, institution and governance, fragmentation and segregation. According to Lemmer and Van Wyk (2010: 248) the curriculum most institutions followed before 1994 was based on old concepts and ideas, unsuitable philosophies, methods and modes of assessment, and most of the curriculum lacked professionalism and was guilty of neglecting practical teaching skills

Teacher knowledge of a subject is vital and has impact on the quality of teaching they deliver in their lessons. Miller (cited in Carl, 2009: 1) points out that the style and adaptation of teachers dictates the quality and standard present in the classroom. Pre-knowledge of teachers usually informs their teaching style and choice of method and invariably has an impact on learning. Reys et al. (2012: 37) maintain that teachers that possess firm content knowledge are able to build their learners understanding of mathematical concepts by giving learners several examples of the same concept. Adequate subject content knowledge and good pedagogical ethics helps to optimise the teaching-learning situation. Awuor (2013) indicates that the effects of under qualified teachers impacts the economy directly and indirectly. According to Awuor (2013) a quality teacher is a person that constantly facilitates learning for all learners in a manner that improves the development of learners' cognitive, social, physical and emotional aspects.

The tremendous paradigm shift in the educational circuit contributes to the challenge of teaching. In the past few years' mathematics teaching around the globe has experienced changes in content and the way it is taught. Dickey (1997: 1) observes that the majority of teachers today are from educational backgrounds where mathematics was taught to homogeneous sets of students using a lecture approach that consisted of collections of facts and skills to be mastered and memorised. The inclusive education policy of today mandates teachers to teach heterogeneous groups of learners, by adapting their teaching strategies and curricula to meet their individual learning needs. For teachers to meet these demands they need professional development of their careers and support systems.

What learners learn and how it can be learned will determine not only the skills and knowledge acquired but also the attitude and beliefs attached to it and its functionality in society (Keitel &

Kotzmann and Skovsmose cited in Keitel & Ruthven, 1993). Over the years, negative ideas and concepts have been developed by learners towards mathematics; in some quarters this has been attributed to the mode and structure of the curriculum taught in the classroom. The Education White Paper 6 (DOE, 2001) acknowledges that a lot of learners experience barriers to learning or drop out of school mainly due to lack of ability of the system to identify and accommodate their different range of learning needs typically through unreachable physical facilities, curriculum, assessment, learning resource materials and method of instructional practice.

In the educational domain teachers continue to experience neglect and lack recognition of their autonomy and power. Gordon (1989: 11) notes that the decision power of teachers in the classroom is not taken into consideration. Teachers are significant entities in the academic field; their inputs are of great value in shaping and improving quality in the system. They have sound knowledge of what transpires within the system and they understand their learners' needs. Fennema and Carpenter (cited in Gordon, 1989: 11) acknowledge that any reform in education that sees teachers as passive recipients of reform is likely to fail, but the reform that takes teachers' beliefs, knowledge and perspective into consideration and engages them in planning and decision making are most likely to be successful.

The challenges teachers experience in teaching learners facing barriers in mathematics have stimulated concerns globally in the past few years. Johnson, Caughman, Fredericks and Gibson (2013: 2) acknowledge that in general research on teaching practice of mathematics is scanty. In South Africa, Machaba (2013: 2) notes that various studies in mathematics have been carried out in mathematics but mostly concentrate on secondary schools, she added that most inquiries focused on classroom variables such as teaching materials that could influence performance and research has not really focused on the attributes of teachers that could negatively influence fruitful learning. Nevertheless various studies across the globe have suggested teaching innovation to improve performance of learners in mathematics and to facilitate their interest in active learning in order to optimise teaching-learning situations. Authors such as Van Cleave (1991), Ferron (1989) and Arvoy and Nardi (2010) proved the potency of using real life experience to illustrate mathematics concepts and procedures to children. They also shared the view that activities such as play enhance skills development and relieve tensions and strain attached to the subject, and children derive fun and enjoyment from it. Ferron (1989) stresses that children tend to grab mathematics concepts outside the classroom in the games they play. The constructivists claim that mathematical knowledge is constructed by students when they reflect on their physical and mental actions (Reys et al., 2012: 23) so they advocate active involvement of the learner in the teaching process which then stimulates and promotes learning.

Another suggestion is that using historical and art instruments or replicas of those instruments to describe and illustrate mathematical principles improves and facilitates knowledge and skills (Shell-Gellasch, 2007). The work of Elster and Peggy (cited by Emmer, 2007) on learning through art buttresses this point; their work reveals that teaching mathematics through the means of art including music dance and artwork enhances mathematics progress. This was evidenced in a study at Queen's University, Canada, in 2002. Their finding shows the benefits of art for learners and teachers, the results reveal a higher percentage in mathematics when the curriculum was presented through art. Mathematical teaching that employs concrete substances and links to learners experience enables them to make sense of the subject, because learning start from within and involve activeness, a process where meaning is constructed, acquired and discovered from one's own experience (Reys et al., 2012: 24).

Equally a narrative/illustrative approach during instructional process could be advantageous in promotion of mathematical knowledge, according to Burton (cited in Barker, Clay and Fox, 1996). Employment of a narrative approach in the mathematics classroom can transform mathematical education practice. Burton argues that mathematics is a socio-cultural artifact and a narrative approach which involves the application of mathematical enquiry processes will help resolve human issues in regards to ways society members' value and relate to each other in the social organisation where they belong (Barker, Clay and Fox, 1996).

MacGregor and Moore (1991) maintain that language skill is necessary for most learning but that academic language requirement for mathematical learning differs from conversational or surface fluency in English. Comprehension of medium of school instructional is vital for all learners. The South African constitution (Republic of South Africa [RSA], 1996) established that everyone has the right to receive education in any of the eleven official languages of their choice in public educational institutions. However multilingualism in the South Africa context has serious implications for educational provision (Lemmer & Van Wyk, 2010: 119). Webb (2004) indicated that the high esteem for English and the negative social sense attributed to Africa language in the society has resulted in a strong preference for English as instructional medium. However, Adler and Reed (2002: 73) maintain that English is the home language of few teachers and learners in the country. Many teachers teach in a school environment that uses English as the official language of instruction but is not the primary language of these teachers and their learners. They add that most textual resources used in teaching and learning in South Africa schools is printed in either Afrikaans or English. Although language policy allows code-switching of language which permits the use of indigenous languages

during formal instructions, Vogel (2011: 181) points out that the code-switch policy has the possibility of reducing the rate at which English language is used in schools.

Teachers are encouraged to consider individualism and the learning ability of each learner during instructional practice because people vary and their ability to understand and learn differs. The Education White Paper 6 (DOE, 2001), acknowledges and respect differences in learners, whether due to age, gender, ethnicity language and social class. According to Hotz (cited in Bley & Thornton, 2001: 1) most students experiencing barrier in learning have the ability to learn but learn differently from their able peers. Cockcroft (1983) avers that attainment and learning rate vary from learner to learner. Effective teachings of mathematics require more than subject knowledge; teachers need to understand their learners and regulate their teaching technique to their learners' different experiences (Reys et al., 2012: 6). Teachers need to understand their learners' learning pace and capacity to optimise learning. According to Walshaw (cited in De Freitas & Nolan, 2008), teaching is influenced by adaptive and interactive variables; learner outcomes are shaped by teachers' active engagement with processes and people within the classroom and beyond. For teachers to relate to and include the above variables in their pedagogy practice they need to acquire sound pedagogy and knowledge of their subject.

Hoadley (cited in De Clercq & Shalem, 2014: 153) indicates that so far research has no proof of the kind of teaching and learning that will have most influence on learner attainment. Meanwhile, barriers to learning mathematics continue to pose a challenge to pedagogy practice, as evidenced by learners' underperformance in the subject. Such underperformance is more visible in township and remote area schools where there is a conspicuous absence or limited supply of resources to stimulate learning coupled with poor economic and social ills in learners' environment. Motala, Morrow and Sayed (2014: 22) are of the view that even though a series of policy documents in education, plans, strategies and interventions have been put in place, and progress that has been made, that the majority of learners in South Africa have not attained the minimum required competencies expected in the curriculum. This evidence was uncovered in the report of Prew and Maringe (2014: 7) which revealed that the percentage of learners that wrote mathematics has dropped drastically in Gauteng province since the inception of the CAPS curriculum in the past few years. According to them the province has two of the 10 districts nationwide that have the lowest percentage of learners sitting for Mathematics in matric. Their report showed that in 2012 or 2013 no district in Gauteng had over half of its matric candidates sitting for Mathematics and they reveal that only 27.5% of learners in Gauteng that sat for Matric in 2013 were able to pass Mathematics.

Equally Machaba (2013: 11) indicates that the results of the Trends in International Mathematics and Science study (TIMSS) of 2003 reveal that South Africa was at the bottom among the 46 countries that participated. According to Reddy (cited in Machaba, 2013: 11) the children of South Africa achieved significantly poorer results in mathematics than all other countries that participated. In addition, Pereira and Du Toit (cited in Motala et al., 2014: 27) state that the CREATE study revealed that learners in Gauteng achieved far less than the levels projected in numeracy tests. Most learners were considerably below the grade anticipated of them (Motala et al., 2014: 27). Venkat's study revealed lack of numbers skills among South African learners in his literature review and performance data from comparative tests (Venkat, 2012: 114).

1.3 MOTIVATION FOR THE STUDY

This study is considered relevant in today's society where acquisition of mathematical knowledge and skill seem very relevant. The skills present a wide range of career opportunities in terms of varieties of job. On a daily basis people encounter numbers and symbols which are significantly associated with mathematics and numeracy and these will continuously feature as technology advances; thus, the knowledge and skills of mathematics are inevitable for one to function and operate effectively in this digitalised age. However, irrespective of the awareness of its many benefits and its impact in today's society the underperformance and hatred for the subject seems to persist, especially in the outskirt areas where experiences of socio-economic challenges are high.

The interest for this study sparked when the researcher was marking the 2013 Annual National Assessment (ANA); the underperformance of schools categorised as quintile 1, 2 and 3 in mathematics was pronounced and was below expectation compared to their peers in the quintile 4 and 5 schools (the former model C schools). These results produced argument among the markers, with the majority blaming teachers for learners' non-achievement claiming teachers often neglect their responsibility and the rest claiming that teachers are contributing their quota and trying their best. Considering the fact that the Education White Paper 6 (DoE, 2001) acknowledges that children and youth have the potential to learn and have the right to receive support, and that the teachers are responsible to accommodate and ensure that all learners receive quality education, the researcher decided to investigate the challenging factors inhibiting the success of teaching and learning of mathematical performance in the outskirt areas, considering the issue from the teaching point of view. The study intends to investigate and understand the challenges experienced by teachers teaching learners experiencing barriers in mathematics in the intermediate phase and to proffer possible recommendation on how to remediate the situation.

This study is important because the world is changing at a fast rate, with globalisation and the advent of modern scientific devices and high tech which predominantly has its root in the knowledge of mathematics and science. We cannot compromise the development of our learners' mathematical skills, especially those from remote areas because their future lies in it. Success will enable them access to a wide range of job opportunities. Further, education plays a significant role in poverty alleviation, and development of learners mathematical skills can be used to break the revolving chain of poverty and alleviate the social ills plaguing poor communities, as these skills will give learners the privilege of been relevant in the labour market. As Bearne and Marsh (cited in Lemmer & Van Wyk, 2010: 184) emphasise, literacy and numeracy are social justice issues; lack of these can exclude one from the mainstream of economics and social life.

However, achievement of such skills rests predominantly on the development of teachers to meet the educational demand. As pointed out above, teachers are the ones who make learning possible, and the inclusive policy maintains that teachers are the prime source of realizing the inclusive educational goal of non-disparity, standard and quality education. The professional development of teachers will enable them to handle diversity and tackle the challenges presented to them in their various classes.

1.4 STATEMENT OF THE PROBLEM

Recent studies reveal severe challenges in teaching and learning of mathematics in South Africa (Fleisch cited in Venkat, 2012: 107). Underperformance of learners continues to cause stress for teachers, added to which are the challenges teachers experience in their pedagogy. Although a number of policies and programmes have been put in place to address the situation, the majority of learners in South Africa have not attained the minimum required competencies expected in the curriculum (Motala, Morrow & Sayed, 2014: 22), as confirmed by in the report by Prew and Maringe (2014: 7) which revealed that the percentage of learners that wrote mathematics has dropped drastically in the Gauteng province since the inception of CAPS curriculum in the past few years.

Further, Motala et al. (2014: 29) report that the Gauteng Strategic Plan 2010 to 2014 revealed that many school governors do not execute their duties and responsibilities; the policies and techniques to run the human, physical and financial resources of schools are often invalid or not in existence.

Addressing challenges in teaching is critical for teachers to be effective in their pedagogical practice. Therefore, this study sought to fill the gap by investigating variables that influence challenges in teaching mathematics to learners experiencing barriers.

1.5 AIM OF THE STUDY

The study sought to investigate the challenges experienced in teaching learners experiencing barriers in mathematics at the intermediate phase level in selected schools in Tshwane South district, Gauteng, South Africa.

1.5.1 Main research question

What are the challenges teacher faces in teaching learners experiencing barriers to learning in mathematics at the intermediate phase in selected schools in the Tshwane South Education District?

The following sub research questions sought to answer the main research question:

- What are the educational related issues influencing the challenges in teaching mathematics to learners experiencing barriers?
- What are the teacher related factors that contribute to challenges in teaching mathematics to learners experiencing barriers?
- In which ways are learner attributes influencing the challenges in teaching mathematics to learners experiencing barriers?
- Which strategies are available for teachers to support learners experiencing barriers in mathematics?

1.5.2 Objectives

The main objective is to establish the challenges face in teaching learners experiencing barriers in mathematics at the intermediate phase in selected schools in Tshwane South education district, Gauteng, South Africa.

The following sub-objectives sought to establish:

- The educational related issues influencing the challenges in teaching mathematics.
- Teacher related factors that contribute to challenges in teaching mathematics to learners experiencing barriers.
- Learner attributes influencing the challenges in teaching mathematics to learners experiencing barriers Africa.
- The strategies which are available for teachers to support learners experiencing barriers in mathematics.

1.6 SIGNIFICANCE

The study intends to make a contribution to the limited base of knowledge by adding to literature on the issue of challenging factors inhibiting teachers when teaching learners experiencing barriers. The recommendations proffered in the study are intended to assist teachers to appropriately address barriers to mathematics learning as required in the policy of inclusive education. Equally the study sought to inform and educate policy makers in relation to relevant needs in the educational circuit.

1.7 THEORETICAL FRAMEWORK

Piaget's theory of how children develop cognitive capacity is the theoretical framework that guides this study. This theory is relevant to the research work because it is necessary for teachers to understand how their learners acquire and construct knowledge. This theory also supports active learning in construction of knowledge and teaching that is learner focused which is the current shift in pedagogical practice.

This theory is relevant to this study as it indicates how children develop cognition at different developmental stage. The focus of the current study is on intermediate phase learners, these learners fall under Piaget's concrete operational stage and formal operational stage. How children develop cognitive at these stages and it implications to learning will be discussed in full detail in chapter 2 and 3.

1.8 RESEARCH DESIGN

1.8.1 Research method

This study used qualitative research methods. The qualitative method according to Creswell (1994), involves process not just outcome. It focuses on meaning, on how people make sense of their lives, world and experiences. Data are collected in their natural setting. The interactive nature of this approach enables the researcher to obtain extensive and comprehensive information from participants.

1.8.2 Research Design

Case study research was used for the study. Creswell (2008) describes case study as the exploration of a bounded system in-depth, for example, exploring an activity, an event, a process, or an individual, based on extensive data collection. Specifically, collective case study was employed in this

study, because collective case study involves more than one setting; this study involved five schools and each individual school is considered a case.

1.8.3 Sampling

Convenience sampling, a non-probability approach, was used to select participants. McMillan and Schumacher (2010: 137) describe this as a non-random technique which implies that not all the population will have an equal chance of being selected; selection is on the basis of being accessible and especially knowledgeable.

1.8.4 Setting

The focus area was circuit 5 in Mamelodi East, Tshwane South district in Gauteng Province. The study concentrated on prioritised schools that are using the GPLMS strategy in Mamelodi East.

1.8.5 Participants

The participants were teachers (educators) of intermediate phase in primary schools, male and female from various cultural backgrounds. Ten educators were selected from five identified primary schools for the study, and two teachers were interviewed from each school.

1.8.6 Instrument

The instrument of face to face individual interviews was used for data collection. Semi-structured and unstructured interviews were employed. Semi-structured interviews which refer to an interview guide approach which enables the researcher to decide in advance the wording and sequence of questions for the interview. Unstructured or in depth interviews, on the other hand, are flexible and come with flexible questions (Tracy, 2012: 139). This approach permits the interviewer boundless freedom to ask extensive questions in ways that appears applicable (McMillian & Schumacher, 2010: 206).

1.8.7 Data analysis

Inductive analyses were used to analyse data. The process of inductive analysis, according to McMillan and Schumacher (2010: 367), involves systemic coding which also include categorizing and interpreting of data to provide explanation of a single phenomenon of interest. The advantage of inductive analysis is that it gives the researcher a new perspective and in-depth understanding of the

phenomenon under study; in that hypotheses are formulated after voluminous data have been collected and synthesised.

1.9 RESEARCH / PHILOSOPHICAL PARADIGM

This research work is guided by the philosophical assumption of the interpretive/constructionism paradigm, which believes that multiple realities are socially constructed through a person and by collections of view (McMillan & Schumacter, 2010: 6). Constructivism concentrates on views, beliefs and the way participants felt; constructivist findings reveal how participants have changed their view and instinct (Woolfolk, 2010: 347).

1.10 REVIEW OF LITERATURE

The literature review involved critical analysis and investigation of local and international literatures, which enabled researcher to have an in-depth understanding of the subject and to analyse similar work and their recommended solutions. Various sources were explored including books, journals, research study findings, articles, workshop papers, internet sources and newspapers.

1.11 ETHICAL CONSIDERATIONS

A letter of ethnical clearance was obtained from UNISA and a permission letter was obtained from the Tshwane South District before the commencement of data collection. Similarly permission was obtained from the school principals where the study was carried out and research details were clearly discussed with all participants and written consent was obtained from them. The anonymity of the participants was taken into account and their school names were not mentioned in the study to protect their privacy and identity. All information gathered was confidential and kept safe.

1.12 CLARIFICATION OF CONCEPTS

1.12.1 Mathematics

Landsberg et al. (2011: 212) describe mathematics as a way of arranging, communicating and manipulating information, using exact mathematical terms; it can be expressed by means of patterns, symbol, and theorems. According to Landsberg et al. (2011: 212) Mathematics is a broad subject comprising mathematical literacy, numeracy and Mathematical science which is spelled with a capital letter M. Coffey (cited in Machaba, 2013: 16) writes that “mathematics refers to the kind of

lower-level mathematical skills one may need to use daily, for instance, calculating costs and change in transactions, basic percentages, averages or company weights”.

1.12.2 Teacher

Educators are also called teachers, they are describe in Norms and standard for educators (NSE) as those individuals who teach or educate other persons or who provide professional educational services at any public school, further education and training instruction or departmental office (RSA, 2000a: 9).

1.12.3 Primary school educator

These are educators who teach at the primary school phase. The primary education system falls under GET (general education and training) and is categorised in three divisions namely, the foundation phase (grade 1 - grade 3), intermediate phase (grade 4 - grade 6) and the senior phase (grade 7 - grade 9).

1.12.4 Intermediate phase

This is the second phase of the general education and training band. It begins immediately after the completion of the foundation phase. It starts from grade 4 up to grade 6. The learning programme that needs to be developed at this phase is Languages and Mathematics. For other learning programmes, schools are allowed to decide on the number and nature of the programme based on the national priorities and learners’ needs.

1.12.5 Teaching challenges

Teaching challenges are seen as any factors that inhibit or obstruct successful teaching and learning processes, those factors that hinder teachers from achieving their set aims and objects in the classroom.

1.12.6 Learning barrier

According to DoE (1997: 12) barriers to learning are factors which result in failure of the educational system to accommodate diversity, leading to learning breakdown or hindering the learner from gaining access to provision of education.

1.13 RESEACH PLAN

The dissertation contents are presented in the following format:

Chapter 1 introduces the topic, presents the background to the problem. The research aims and methods are highlighted.

Chapter 2 presents the theoretical framework that underpins the study, and reviews the related literature regarding the challenges experienced by teachers teaching learners experiencing barriers in mathematics in intermediate phase.

Chapter 3 outlines the research design and method employed for the study.

Chapter 4 presents the data analysis and results and discusses the study findings.

Chapter 5 comprises a summary of the findings, recommendations, conclusions and recommendations for further research.

1.14 CONCLUSION

This chapter introduced the topic and presented the background to the problem and the research aims and methods. The following chapter presents the theoretical framework that underpins the study, and a review of related literature.

CHAPTER 2 : LITERATURE REVIEW

2.1 INTRODUCTION

The preceding chapter outlines the problem statement and contextual background of the study. The present chapter reviews literature on the challenges in teaching learners experiencing barriers in mathematics at the intermediate phase. The literature review is structured around the sub-research questions guiding the present study which are as follow: What are the educational related issues influencing the challenges in teaching mathematics to learners experiencing barriers? What are the teacher related factors that contribute to challenges in teaching mathematics to learners experiencing barriers? In which ways are learners' features influencing the challenges in teaching mathematics to learners experiencing barriers? Which strategies are available for teachers to supports learners experiencing barriers in mathematics? The themes of the literature review were in accordance and derived from the sub research questions.

Related literature from across the globe was reviewed; local and global perspectives were not viewed separately but uniquely fused together to understand the challenges experienced in teaching learners experiencing barriers to mathematics.

Various studies have reported challenges faced in teaching mathematics to learners experiencing barriers in the subject (Desforges & Cockburn, 1987; Dickey, 1997; and Gordon, 1989). Mercer, Mercer and Pullen (2011: 407) acknowledge that there is an increase in the amount of research in the area of mathematics teaching in recent years but indicate that lot still needs to be learned. Equally Speer, Smith and Horvath (cited in Johnson, Caughman, Fredericks and Gibson, 2013: 2) recognize that little research has been conducted regarding mathematics teaching practices. In South Africa, Machaba (2013: 2) identified that various studies in mathematics have been carried out but mostly centered on secondary schools; she indicated that most inquiries focus on classroom variables such as teaching materials that could influence performance. These studies do not focus on the attributes of teachers that could negatively influence fruitful learning.

As Simon (2013) states, the most critical challenge in mathematical education is the development of teaching theory that can direct mathematics teaching, instructional design, teacher education, and research in all these specified areas. This is to acknowledge that teaching is full of complexity and a practice filled with pressure (Adler; Jaworski cited in Adler & Reed, 2002: 3). Instructional practice of mathematics is a complex tasked that focuses on numerous aspects, including teachers' need to

understand various contents of mathematics areas, their conceptual understanding of the content and teaching it skilfully with confidence, and the skill to be acquainted on how children learn and make sense of the diverse knowledge of math structures (Cathcart, Pothier, Vance, & Bezuk, 2006; NCTM, 2000, cited in McKinney, Chappell, Berry & Hickman, 2009: 280). However, Boaler (cited in Sullivan, Mousley & Zevenbergen (2006: 117) indicated that research on specific actions which can help teachers achieve their goals in teaching are limited. Boaler (cited in Sullivan et al., 2006: 117-118) calls on researchers in mathematics education to study more classroom practice in order to gain understanding of relationships that exist between teaching and learning.

Provision of standard and qualitative education to children of different backgrounds with heterogeneous needs is a challenge teachers are confronted with worldwide. Educational provision in this present time anticipates that teachers will structure and effectively plan their instructional activities in such a way that optimizes learning for all students. Teachers are obliged to adapt their teaching methods and curriculum to meet all learning requirements of individual learners including those experiencing barriers in their classrooms. According to McKinney et al. (2009: 279) this shift in instructional approach differs from the traditional method which is fully teacher directed that places more emphases on understanding of procedures.

In light of the above argument the following sections explore discussions on the challenges experienced in teaching learners experiencing barriers in mathematics. However, before proceeding, it is appropriate to first establish the theoretical framework that informs and guides the study.

2.2 THEORETICAL FRAMEWORK

A theoretical framework is a parameter that gives direction to a study; this parameter enables researchers to clearly understand the projected study. Maxwell (2013: 39) indicates that theoretical framework is also referred to conceptual framework. The crucial thing about one's conceptual framework is that it's a model or plan of what one intends studying (Maxwell, 2013: 39). Baxter and Jack (2008: 553) see theoretical framework as being a firm contingent for a study which is also referred to when interpreting data.

Machaba (2013: 22) describes a theoretical framework as a lens which researchers use to view the world and reflects the standpoint adopted by researcher; according to her this helps in devising assumptions about the study and how it is connected to the world, hence frames the work, anchors it and facilitates discussion between the literature and the research.

Specifically this study draws on Piaget's constructivist learning theory, more particularly the concept of cognition. This theory is significant because Piaget's principles of learning are based on cognitive construction. He claimed that through active engagement in the learning process children construct their own learning and maintain ownership of what they have been taught (Piaget, 1970).

Cognition is described as a set of mental capabilities and practices that is linked to knowledge, memory, attention, reasoning etc (Wikipedia). This concept is applicable in the present study because learning activities involve cognitive traits (knowledge, memory, attention, and reasoning). The cognitive concept developed by Piaget is relevant for pedagogy as these will enable teachers to determine what learners are capable of acquiring at a particular cognitive stage. Schultz, Colarusso and Strawderman, (1989: 4) maintain that teachers' awareness of a child's cognitive stage helps them to determine the appropriate teaching materials and methods that will help a child learn and understand according to his or her ability. According to Reys et al. (2012: 24) studies have shown that each level of children's cognitive growth offers a wide opportunity for learning mathematical activities and at each level the maximum children can learn is determined by the skills and concepts they previously acquired.

Piaget engaged the idea of constructivism to create his model of cognitive development (Tokuhama-Espinosa, 2010: 55). Present day pedagogic practice is embedded in constructivist philosophies, given their approach which is that learners are the active constructors of their own knowledge and explains the differences in the abilities of learners, their style of learning, needs and interest (Eraslan, 2013: 155). Substantial evidence has proven the impact of active participation of children in the teaching and learning process (Turner & Hamner, 1994; and Bakhurst & Shanker; Smith cited in Shotte, 2013: 155). Piaget (1970) recognized that when children engage actively in learning process, they are able to construct their own knowledge from their personal experience and this helps them retain and ground their understanding of any concept learnt. This study sought to establish the importance of learners' active role in the teaching-learning process and how their activeness can lead to acquisition of knowledge. Reys et al. (2012: 24) argue that learning is conceived from within and an active process, where meaning is constructed, acquired and discovered from one's own experience.

The focus for the study is the third and fourth Piagetian stage, but, it is necessary to explore the first and second stage as well because understanding of these will afford teachers the opportunity to recognize the level where a learner experiencing barriers is locked in currently and the stage where they are actually supposed to be.

2.2.1 The conceptual notion of constructive learning

Piaget is of the view that the classroom needs to be a constructivist environment (Ozer, 2004). His understanding was based on the notion that knowledge is constructed by an individual, and argues that an infant is born with the inherent ability to adapt and learn from their world and initiation of learning is accomplished through their active involvement (Turner & Hamner, 1994: 18). He advocates constructive learning and believes children learn better and claim ownership of what is learnt when they have engaged actively in the learning process. Piaget is assumed to be the founder of the constructivism movement, made up of those who argue that an individual creates knowledge from the interaction which exists between their experience and ideas (www.learningandteaching.info/learning/paiget.htm). According to constructivism knowledge is constructed or actively created not received passively, thus, new mathematical knowledge is constructed by learners when they reflect on their physical and mental actions. Learning is a reflection of social practice; in the learning process children participate in conversation and debate among peers and teachers as they develop mentally (Reys et al., 2012: 23-24).

Constructivists argue that children actively partake in their own learning and new knowledge is actively constructed each time they intermingle with their environments (Bakhurst & Shanker; Smith cited in Shotte, 2013: 155). They assert that people are appreciative of information they create on their own (Ozer, 2004). Machaba (2013: 22) maintains that the theory of constructivism places a child in an active role in the learning process; learning is not taken in one piece but reformed and adjusted according to the mental structure, prior learning, setting and social dealings of the child. Active participation of the learner in the teaching and learning process and teaching that is centralised on the learner is the current paradigm shift advocated for pedagogical practice. Referred to as 'learner-centred teaching', this type of teaching directs learners in the construction of thoughtful knowledge through the means of shared social settings and helps them discover knowledge through their active employment of critical thinking and their reflection on what they understand (Ellis, 2013: 9).

It was Piaget that first introduced the notion that learners construct knowledge not merely receives it from their teacher and that knowledge construction is based on students' own experiences (Ozola & Purvins, 2013: 134). Thus, learners are not empty vessels to be spooned full of knowledge or empty minds to be written upon rather they construct their knowledge (Tokuhamma-Espinosa, 2010: 55). According to Piaget children construct their own understanding of mathematics; it is not set up like a rock nor obtained as a gift from others (Reys et al., 2012: 23). Briggs (1996) concurs by

indicating that when mathematics teaching at the primary level is fashioned in line with the thinking process and mental structure of children it is very effective.

Reys et al. (2012: 24) maintained that cognitive development is part of three developmental processes which influence pedagogy and the learning of mathematics. According to Piaget cognitive development happens through three processes, namely, assimilation, accommodation and equilibrium (Smidt, 2013: 19). Turner and Hamner (1994: 18) maintained that children use assimilation and accommodation to arrange their information. Assimilation happens when existing schemes are used to understand new events in the environment (Woolfolk, 2010: 33), and example of this being an infant attempting to suck whatsoever is placed in their mouth as a result of their breastfeeding experience (Mwamwenda, 2004: 85). What happens in this situation is that the child tries to fit new information using an existing scheme. Accommodation on the other hand takes place when someone modifies or makes alterations to the structure of cognition in order to accommodate new conditions (Woolfolk, 2010; Ozola & Purvins, 2013). Both assimilation and accommodation make up what Piaget called adaptation (Piaget & Inhelder cited in Mwamwenda, 2004: 85).

According to Turner and Hamner (1994: 18) development in children leads to changes in mental structure in a qualitative way and shifts occur in knowledge organisation in a certain stage order which do not differ among children. Briggs (1996: 3) maintained that “Theoretically, the thinking processes of children and the information they are able to process depends on their stage of development within Piaget’s operational stages”. Piaget’s cognitive constructivism was established on how children grow and change over time during their developmental stages, Piaget view on development is linear, implying that development progresses in lines (Smidt, 2013: 22). Piaget’s theory helps teachers understand how learning occurs as development progresses and this assists them to understand how to handle children of each stage during their pedagogical practice.

2.2.2 The four stages of cognitive development postulated by Piaget

2.2.2.1 Sensorimotor and preoperational stage

The sensorimotor stage according to Piaget (cited in Woolfolk, 2010: 33) is the first phase of child development which marks the period when thinking takes place through the means of senses. This stage is from age 0 to 2 years. Children of this stage employ their senses such as visual, hearing, tasting, touching senses and motor action to understand and explore their environment (Briggs, 1996: 3; Woolfolk, 2010: 33). Sensory processes form the basis for infants’ cognition of object attributes; infants are able to know object properties and quality by involvement in practical

activities. They can feel and inspect objects with their hands, and can trace its shape and size with their eye movement, referred to as perceptual operation (Leushina, 1991: 28).

According to Mwamwenda (2004: 85) children of this stage are able to organise and adapt, and construction of mental representation begins from this stage (Woolfolk, 2010: 33). Leushina (1991: 26) emphasised that children, by relying on their sense effective perception, will not only learn quantity recognition but will be able to represent their ideas and perceptions in proper words, using appropriate terms like larger, or smaller to represent quantity. Additionally, Cross, Woods and Schweingruber (2009) indicate that numerous studies have validated infant ability to recognise relationship between numbers and their understanding of addition and subtraction and the ability to discriminate between numerical sets. Research on perceptual operation confirms that sensory processes form the basis for the development of first notions in mathematics (Leushina, 1991: 29). Thus, mathematics learning begins at infancy and knowledge of numbers and quantity starts at this crucial stage which is basis for all learning.

The preoperational child, according to Mwamwenda (2004: 87), is a child between the ages of 2 - 7 years referred to as early childhood. A child at this stage cannot match and seriate numbers, decentralise, and lack classification skill. However children at this stage think in symbolic forms, their thoughts are expressed through symbols and they represent their actions through thought and language (Niemand & Monyai, 2006). Language development is rapid at this stage because it fosters communication (Mwamwenda, 2004: 87). A child's thinking is tied to one direction and they have challenges in seeing others' perspectives (Woolfolk, 2010: 34). Conservation is difficulty for children at this stage; they find it challenging to reason that if nothing is added or taken away, the amount of substance has to remain the same or objects remain the same irrespective of change in shape or arrangement (Ormrod, 2014). However, developments of skills that enable them to perform higher mathematical operations begin at this phase and they develop one to one correspondence which helps them to learn counting, adding and subtracting (Schultz et al., 1989: 5). It can be concluded that a child who lags behind in acquiring the basic mathematics concept from this stage is likely, and can be vulnerable to, experience barriers in mathematics at a later stage.

2.2.2.2 Concrete operational stage

The concrete operational stage is between 7 - 11 years. This stage marks the onset of logical reasoning though dependence on practical aids (Tokuhama-Espinosa, 2010: 44). According to Berger (cited in Brigg's, 1996: 4) children acquire the capability to understand and use logical sense in precise context at this stage. However this operation is restricted to manipulation of concrete

substances (Woolfolk, 2010: 35). Concrete, according to Niemand and Monyai (2006), implies that children will rely on the physical substance they can see and handle to solve problems. Conversely, Thomas (cited in Mwamwenda (2004: 89) states that concrete does not necessarily imply children have to handle and see the particular object as they solve problems. However, Mwamwenda (2004: 89) added that problem solving must consist of substances that can be directly seen or imagined.

2.2.2.3 The intermediate phase

The intermediate phase learner falls under Piaget's concrete operational and formal operational stage, the age for this stage ranging from 10 - 12. Concrete operational children according to Piaget learn more when they are exposed to physical manipulative substances. He also noted that some of the formal operational children are tied to concrete phase, which means that their learning of mathematics will be accelerated if they have the chance of experiencing substances that can be manipulated during learning (Woolfolk, 2010: 37).

Children at this phase should engage in a form of learning that permits them to use tangible substances that they can explore (Mwamwenda, 2004: 96). Charlesworth (1991) claimed that children gain better understanding and sustain it in teaching situations where they are allowed to manipulate concrete objects. Harries and Sutherland (cited in Thompson & Thompson, 1999) write that learners construction of knowledge cannot be separated from external representation in term of pictures, icons and mathematical symbols such as tables, graphs and arithmetic symbols that include counting with fingers. Using paper tallies that enable children to count large numbers, and using paper based multiple algorithms that aid multiplication; help learners achieve what seems difficult in mathematics. May (1974) adds that concrete substances provide models for learners to better understand textbook diagrams; a child that experiences taking away objects from a given set will understand a subtraction diagram.

Children's manipulation of their environment by means of cognitive pictures start at this stage and children question whatever they perceive. This stage also marks children's ability to reverse their thoughts and understand conservation (Schultz et al., 1989: 5). They have concrete awareness of conservation of continuous and discontinuous quantities; likewise they have the understanding that when a set of objects is rearranged, the set can be reversed to undo the rearrangement. For instance, they understand that operations such as $3-1=2$ can be reversed and be represented in another operation as $2+1=3$ (Kramer, 1978). Likewise children of this stage can classify objects in a logical and systematic way – they understand the concept of class inclusion. They understand that a class would be smaller than any additional class that contained it (Mwamwenda, 2004: 91).

Children of this stage learn better and their understanding is grounded when pedagogic activities are based on active participation of knowledge construction. The guiding principle and standard for school mathematics as per the National Council of Teachers of Mathematics (NCTM) (2000) stipulates that students must learn mathematics with understanding. Learning of mathematics should not be based on the use of rote memory but emphasis should be placed on understanding. Understanding is derived when learners engage actively in pedagogical practice and learning processes which provide and encourage activeness of learners. This facilitates learning and children claim ownership of what they have learned because they are involved in the process. The knowledge children acquire from own experiences while exploring and interacting with concrete objects in the classroom have advantage. . According to Glaserfeld (1995) this knowledge is the product of learners' active engagement rather than the learner passively receiving lesson instructions. Kennedy (1991) states that children that experience concrete material in teaching and learning environment develop better mental images than children with less exposure to such material and that these children have a clearer view of the concepts being taught. Aepman and King (1993: 2) aver that there is a transformed interest in learning through experience. The NCTM commends the importance of active participation in building new knowledge from prior experience (NCTM, 2000). Aepman and King (1993: 2) maintain that learners' ability to organise, interpret questions and information, guess and identify patterns and their ability to analyse and to reason logically are all orchestrated and developed through experience. Most learning theories state the benefits of children physically manipulating substances and actively participating in mathematics in the classroom in order to foster the development of mathematical knowledge. Teachers that incorporate these ideas in their pedagogy are most likely to experience stress-free learning and teaching situations.

2.2.2.4 Formal operational stage

The fourth phase is the highest level of Piaget's cognitive development. The formal operational stage, after eleven years of age, is where a child is able to reason on the basis of proposition and they acquire the potential to think abstractly (Kramer, 1978). A child is able to think scientifically at this stage, they generate hypotheses and think analogically, which is the ability to compare something to another thing because of what they possess in common or their similar attributes (Smidt, 2013: 24). According to Piaget, mathematics capacity is likely to improve at this phase. Abstract mathematics such as word problems should be easy for students to solve and negative number and infinity concepts should not be difficult for learners that have attained this stage to understand (Ormrod, 2014).

The above discussion sheds light on how children acquire cognition which better equips teachers and guides them during the process of pedagogical activities. Piaget (1970) noted that learning will only take place when a child reaches the readiness stage. Children perceive number and size differently from an adult; the knowledge that the amount of substance remain the same when its shape changes or collection of number remain the same when the number are rearranged happen naturally when a child is ready for the idea (Apelman & King, 1993: 29).

In conclusion, it can be agreed that Piaget's developmental theory has had a tremendous impact on pedagogical practice although there is an on-going argument about whether the theory still hold in this contemporary social setting (www.teachnology.com, n.d.). However, this researcher's view is that teachers that employ the ideas Piaget postulated in his theory and incorporate these into their pedagogical activities will experience a stress-free atmosphere during pedagogical practice and the outcome will be better performance of learners.

2.3 THE EDUCATIONAL RELATED ISSUES INFLUENCING THE CHALLENGES IN TEACHING MATHEMATICS TO LEARNERS EXPERIENCING BARRIERS

2.3.1 Change in pedagogy practice and subject contents

The present paradigm shift in teaching positioned teachers in a dilemma regarding the pedagogical practice of mathematics. Dickey (1997: 1) acknowledges that current mathematics teachers are faced with challenges in term of changes in mathematics content and teaching approach. Similarly Reys et al. (2012: 37) states that teachers have the responsibility of teaching new mathematical concepts and topics in a manner different to the way they were taught in school. According to Van de Walle (2004) the procedures and concepts of teaching mathematics are now sophisticated and entail more than the previous traditional computation skills. The majority of today's teachers received education in a rigid traditional style, rooted in memorization, where students learn through recitation procedures and lack understanding of the concepts taught (Ferron, 1997). These teachers that were educated in a homogenous setup with lecture techniques are now expected to teach diverse sets of students employing active teaching techniques (Dickey, 1997: 1). The traditional angle of teaching assumes the teacher's role is that of transferring knowledge to sets of students who are passive receivers during the learning process, and their emphasis is on the step by step approach, memorizing and learning by sets of rules (Eraslan, 2013: 154). However, Reys et al. (2012: 49) maintain that the focus has shifted and is now based on learners' active participation in teaching and learning process – the teacher engages them in class activities and discussion. Grootenboer and

Jorgensen (2009: 255) aver that the pedagogy practice of school mathematics has concentrated on procedural knowledge for too long, rather than focusing on in-depth understanding.

Hiebert; Van De Walle (cited in McKinney et al., 2009: 279) argue that despite the numerous changes in method of instruction in mathematics content areas, traditional teaching practice still dominates in mathematical education. As stated by Stigler and Hiebert (2004), teaching is culturally inclined, it is learned implicitly and it's an activity that is tough to change. Teachers cultivate forms of behavioral structures that distinguish their pedagogic practice. This structure of behaviors may be an indication of ideas, principles, and preferences which are held deliberately (or not deliberately) that might have developed from teachers experience (Thompson, 1984: 105). To now change the pedagogy practice that is implanted in one's belief and style is very difficult. Johnson (2006) stated that change in the practices of instruction is not easily accomplished without conflict either from internal or external sources. According to Fullan (2007), changing the approach of teaching or style relating to the use of new materials comes with countless problems especially if new skills need to be attained and new patterns of instructional practices need to be established. He goes on to say that this difficulty is greater if it a change in belief is necessary, as this requires a change of the fundamental values held by the individual concerning the educational purpose. Thompson (1984) added that questions on how teachers should incorporate their mathematics knowledge into their style of teaching practices and what part their mathematics conception might contribute in teaching have been largely neglected.

Nevertheless there are global campaigns on teacher's adaptation of teaching techniques, curriculum and resources to meet all learning requirements of diverse learners and the need for teachers to accommodate diversity in their classes, which is the key to inclusivity. Implementation of inclusive education and training in South Africa, according to the Education White Paper 6 (Gasa, 2011: 16) is about attitudinal change, change in behaviours, method of teachings, curriculum and environment to meet learners' need, as well as about empowering learners to develop their personal strength and enable them to part take critically in learning the process. This task requires professional resources and development of teachers for successful implementation. Da Costa (2003: 23) proposes that the critical aspect of implementing inclusive education is development of human resources. According to Gasa (2011: 16) belief and support for an inclusive education policy are not sufficient to ensure that the system works practically. Teachers need to acquire relevant professional skills that will enable them to manage learners' diverse needs in their classroom. Johnson (2006) calls for greater efforts in professional development. He argues that only through this can a stakeholder in science education carry on to work in the direction of changing teaching practice.

Teachers are called upon to adopt the new educational shift, a teaching shift that respects and makes allowance for individual learning needs. The shift in form of curriculum differentiation considers the rate of learners' capability to access the curriculum, learners' interests and previous experiences the context of teaching and learning, and method and assessment strategy (Engelbrecht, Swanepoel, Nel & Hugo, 2013: 34). This strategy of teaching has a link with teaching as advocated by constructivism. The constructivist learning concept is based on an approach that accounts for differences in the abilities of students, their style of learning, needs and interest (Koc, Isiksal, and Bulut, 2007 cited in Eraslan, 2013: 155). This approach centres on instruction of students as the active constructors of their own knowledge and teachers being just guides in the process, concentrating on students learning not on delivery of content (BOE cited in Eraslan, 2013: 155). Constructivism proposes that children cannot be taught through telling or instructing (Van de Walle 2006: 4). Constructivists claim that learning does not occur outside of an individual (Ellis, 2013: 13), that it is necessary to involve them and let them exchange their ideas during teaching and learning. Ozola and Purvins (2013: 137) argue that in education today both teachers and their students are active participants in the classroom during the process of teaching-learning.

The expectation of meeting the demand for content and pedagogy shifts by teachers include expectations to effectively deal with the impact of poor social and economic circumstances such as poverty, violence, ill-health, etc. Adler and Reed (2002) point out that teachers deal with Acquired Immune Deficiency and violence in their classes and they make a contribution in the alleviation of those social ills and couple by addressing the complex needs of their individual learners. At the same time they are held responsible for their learner's performance in high stake tests. Fullan (2007) adds that teachers continuously deal with day-to-day disruptions, both within and outside the classroom, such as handling discipline and interpersonal conflicts, and dealing with principals, parents and other staff. However Welch cited in Adler & Reed, (2002) stresses that the demand placed on teachers to care for all and at the same time produce good results pull on classroom practice in contrary ways. Engelbrecht et al. (2013: 38) are of the view that the major challenge in classrooms in South Africa are not teachers' negative attitude nor their lack of support for policy, but the lack of relevant support from educational agencies like district personnel to ensure that teachers receive the right knowledge regarding the strategy and make sure policy is well implemented.

2.3.2 Educational reforms

The need for curricular reform is imperative in the educational domain given the global change and various innovations witnessed in the past few years especially in the areas of science and

information technology. According to Pang (2013: 20) the shift in paradigm in educational policies and in administration in various nations is brought about as a result of globalisation. The renewed considerations that lead to changes in pedagogy in the educational domain are driven by globalisation and the forces of economics (Shotte, 2013: 151). The main force backing this reformation all over the western world in the 1960s was the numerous forms of civil rights movements, pointing to scores of inequalities (Fullan, 2007). Eraslan (2013: 152) notes that many countries around the world in the last twenty years have undertaken changes in their school curriculum, specifically at the elementary and secondary phase.

Major contributory factors to the decline of educational standards, as highlighted by Gezahegn (2009: 9), are impoverished facilities, absence of instructional material coupled with reduction in teacher quality. This decline in standards has had a great impact on mathematics and science. Reformation of the education system is necessary according to Reddy, Van der Berg, van Rensburg, and Taylor (2011) who state that at the international level students enter tertiary institutions with deficits in mathematics and science knowledge. Reddy and colleagues (2011) argue that mathematical knowledge is not growing at the top end compared to the growth in science considering the information oriented and technology orientated globe we are living in. Fullan (2007) states that since 1960s notable progress has not been evident, even with the renewed interest in 1980s in large scale reforms that focus on accountability.

In the United States, racial inequality in the teaching of mathematics resulted in the formation of the National Council of Teachers of Mathematics to develop a reform standard (NCTM, 2000) that would address the inequality in mathematics instructions (Holloway, 2004). McKinney et al. (2009: 278) aver that since the release of principles and standards for school mathematics (PSSM) the teaching and learning of mathematics has attracted much attention. The council recommends coherent mathematics curriculum at all grade levels, and expects a high standard for all students with teachers that understand the learning needs of students and then challenge and support the students. They also suggest an instructional approach that builds new knowledge from experience and prior knowledge, and assessment that will support learning and give both teachers and students important information. They recommend technology in teaching because of its influence on teaching of mathematics and how it can foster students' learning (Holloway, 2004). However, McKinney et al. (2009: 278) indicated that irrespective of the clarity in standard and goals of these principles, many classrooms are still falling short on the implementation and directive. Fullan (2007) maintains that change will continue to fail until ways of improving infrastructure and processes is discovered which will engage teachers in the development of new knowledge, skills and understandings.

In the South Africa context, changes in school curriculum are apparent since 1994. Singh (2013: 688) indicates that typical changes occurred in the educational knowledge system of South African over the past decade, symbolizing the rising and changing needs in education of a developing country. What necessitates reforms in education according to Adler and Reed (2002: 7) is the curriculum renewal and reform which is on the world agenda, coupled with South African curriculum reform where there is an urgent need for redress and repair. The need to redress the old educational system was enormous after the apartheid dispensation. Apartheid gave birth to vast inequality in society and destroyed the fabric of society (Adler and Reed, 2002: 7).

The importance of curriculum change in reforming the educational system cannot be neglected. Schmidt (2004: 6) argues that curriculum is the central aspect of the educational system which spells out what should be accomplished by schools in terms of areas where no child should be left behind. However, lack of teacher capacity to welcome the new innovative changes in their classrooms has resulted in anxiety, stress and tension in the teaching community (Kyriacou, 1998; Singh, 2008; Singh 2011 cited in Singh, 2013: 688). Eraslan (2013: 152) states that implementing the new innovation for many teachers demands changes in their teaching approach, requiring them to develop adequate knowledge of the contents of the new curriculum and to acquire competencies appropriate to teach in the new manner. Johnson's (2006) findings are that many teachers do not implement reforms and those that do it are not doing so properly. However Carless (1998) revealed inadequacy on information to implement curricular. According to Singh (2013: 688) failure to implement the curriculum is a usual problem faced in a situation where there is lack in skill and knowledge to teach such subject matter. Equally, Fullan (2007) points out that adoption of innovation were superficial with alteration of some of the language and structure. Johnson (2006) states that, changes can seem to be a difficult task given that the process of successful change entails intensive and collaborative efforts.

Eraslan (2013: 153) identifies various factors that contribute to resistance to new curriculum change in the classrooms, namely, teachers' beliefs regarding the change, their training background, the lack of professional support, large class size, the influence of new textbooks and inadequate applicable materials. According to Singh (2013: 688) the major persisting challenges teachers encounter in educational transformation are limited professional development and absence of resources. Curriculum reforms without adequate intervention will continue to pose a challenge as long as teaching practice is concerned. Studies on school curriculum reform reveal that the belief system and understanding of teachers on the proposed reform play a significant part in the implementation of the reformation idea (Carless, 1998; Thompson, 1984). A report by Thompson (1984: 125)

revealed that from the evenness observed between ideas declared by teachers regarding mathematics, and the way they teach the subject contents, truly indicates that the opinions, principles and preference teachers hold regarding mathematics impact their choice of teaching practice.

Fullan (cited in Johnson (2006) acknowledges that evidence from research has proven that the success of any educational reform efforts depends on the teachers. Teachers play a significant part in ensuring quality implementation of any educational reform (Fullan cited in Hay, Smit and Paulsen, 2001: 213). Even so, Gordon (1989: 11) points out that the decision making power of teachers in the classroom is generally not considered because they are often not considered when prominent decisions related to teaching and learning are made. Excluding teachers from matters that concern pedagogical practice will normally lead to resistance since they are not involved on how the decision was made, and these situations usually result in conflict among policy makers and school personnel. Fullan (2007) maintains that policymakers claim that teachers are resisting change while teachers on the other hand complain introduction of change is often meant for self-glorification of the policymakers. They claim that policymakers know little regarding what is needed neither do they understand the classroom process. Teacher authority in the classroom cannot be neglected as this is crucial in stimulating the teaching and learning situation; empowerment enables teachers to feel comfortable and confident thereby maximizing their potential. According to Carl (2009:3) empowerment is viewed as a growth and development process that allows teachers to optimize teaching and learning and their potency as educators. However, Morrow (cited in Gordon, 1989: 8) stated that the Department of Education and Training is a bureaucratically run organization and teachers have no voice in matters relating to their own schools, like curriculum matters and upgrading of programmes. Teacher input is crucial in educational matters because they are the implementers of any reform or change in curriculum, therefore the knowledge and experience they have regarding classroom process should be acknowledged. Fennema and Carpenter (cited in Gordon, 1989: 11) propose that any reform in education and mathematics teachings that regards teachers as passive recipients of the reform is likely to fail, but reform that takes teachers' beliefs, knowledge and perspective into consideration and engages them in planning and decision making is more likely to be successful.

Compliance with change is a serious challenge confronting teachers. Gorton (cited in Carl, 2009: 116) admits that resistance to change is a complex phenomenon and curriculum administrators should invest quality time in detecting its cause before engaging in any plan on how to diminish it. According to Stenger (1998, cited in McKinney et al., 2009: 280) "reform efforts are often met with

and conflict teachers' own perceptions of how mathematical concepts should be taught and learned". Teachers' views and behavioral patterns are mostly what constitute their chosen method and strategy during instruction practice. However this pattern of behavior was not acquired overnight and for teachers to make a shift they will need reorientation of their belief system and need to be equipped to manage the new innovational change. Zimmerman, Lunn, Wildermann and Singh (cited in Singh, 2013: 688) point out that if teachers are not well equipped for curriculum change they will feel intimidated by the prospect of that innovative change.

In the following sections, various curricular reforms in the South African educational context after the apartheid dispensation and their impact on teaching and learning will be discussed.

2.3.2.1 Outcome- based education (OBE)

Flanagan (1998) stated that a paradigm shift took place from the traditional educational system in South Africa, in order to redress the segregation and inequality in the system of education. An outcome-based education approach was adopted to address and transform the traditional system of education (Pretorius & Lemmer, 1998). The outcome-based approach was introduced to replace the Apartheid curriculum in the General and Further Education and Training bands and this curriculum was referred to as Curriculum 2005 (C2005). This curriculum was intended to serve as an instrument for a new political vision consisting of a set of values derived from the South Africa constitution and was linked to human rights, social justice, equity and development (Lemmer & Van Wyk, 2010: 53).

The emphasis in Outcome-Based Education (OBE) is on what learners are expected to know, understand, do and become, not what teachers plan to achieve (Carl, 2009: 84). This approach outlines the sets of outcomes learners must have attained at the end of their learning programme to prepare them for lifelong learning achievement (Department of Education, 2002). The outcome-based model was in line with the principles of competency-based learning (Department of Education, 2002). This approach is committed to making certain that the whole learner attained the specified proficiency before leaving school. Outcome-based education is classed as a learner-centred approach to learning and teachers were to act as facilitators and make use of teaching methods that place emphasis on active based learning (Lemmer & Van Wyk, 2010: 53). Donald, Lazarus and Lolwana (2002) pointed out that OBE concentrates on using strategies of teaching that put the learner at the centre. According to them, learners should be able to show that they understand and be able to use the outcome in different learning situations.

However, Singh (2013: 688) notes that the introduction of the OBE approach in South African schools brought about a discrepancy between the knowledge of teachers respecting the traditional

curriculum and the OBE curriculum. Outcome-based education attracted numerous criticism from implementers as well stakeholders. Among the problems teachers complained about was the complexity of the approach and that OBE learning can only be realised in well-resourced schools that with well qualified teachers (Jansen & Christie cited in Lemmer & Van Wyk, 2010: 53). Engelbrecht et al. (2007: 21) pointed out that OBE do not considered the restrictions of the traditional system which is associated with time, calendars, grades, passing and failing as an important facet to achieve outcomes.

Lemmer and Van Wyk (2010: 124) indicated that OBE contained twisted structure and design, an ambiguous terminology and insufficient training and development of teachers, all of which compelled reappraisal of the curriculum. Likewise a report by Singh (2013: 695-696) on the impact of the OBE approach on teaching revealed that 98% of teachers that participated in the study believed that the load of administrative work required took away quality time that could be invested in teaching, and 94% believed that they lacked professional competency to teach the OBE curriculum, while more than 50% believed that teaching anything without basic adequate training in that subject area had a damaging effect on their ability to impart knowledge to their learners. Many believed that their role had been reduced to mere facilitator during the process of instruction (Singh, 2013: 696). Feiman-Nemser (2001: 1013) noted that reforms in curriculum can be an important point of departure, but if teachers cannot creatively use them it make no sense. In the same vein, the National Commission on Teaching and America's Future (cited in Feiman-Nemser (2001: 1013) indicated that policies can only bring improvement to a school system if the school personnel are well equipped with the necessary skills, knowledge and support.

2.3.2.2 National curriculum statement

The problem encountered in implementing the OBE model caused much dispute in the public and academic arena (Lemmer & Van Wyk, 2010: 124). The lack of alignment and poor execution called for revision of the curriculum which led to introduction of the Revised National Curriculum Statement (Rembe, 2012: 16). Curriculum 2005 was reviewed and replaced by the Revised National Curriculum Statement in 2002 (Lemmer & Van Wyk, 2010: 124). The national curriculum statement concentrated on the impact of curriculum 2005 (C2005). The word Revised was taken out and the curriculum was called National Curriculum Statement. It was first introduced to grade R - 9 and later stretched out to the further education and training band for grades 10 - 12. Implementation from grade 10 was to take place in 2006 (Carl, 2009: 86). Motala et al. (cited in Rembe (2012: 16) indicate

that NCS stresses basic skills, content knowledge and grade progression as well as focus on learners and the importance of support for teachers.

Du Plessis (2013: 55) indicated that there is considerable dispute and dialogue regarding the removal of OBE, but her view is that OBE is not a curriculum but a teaching method. Her point of view is that the teaching method remained unaffected and it is the curriculum that has been repackaged. The curriculum is now written in content form which is a change from the former outcomes form. De Clercq and Shalem (2014: 156) maintained that NCS introduction and training suffered from a weak model. Compared to the scant material delivered for C2005, the RNCS was more elaborate, but nonetheless many teachers and principals complained that the material was lengthy to read, too general and unsupportive. Lemmer and Van Wyk (2010: 252) pointed out that changing to the new curriculum was simply implemented within the in-service training of teachers using a model called cascade which turned out to be insufficient and ineffective. According to Du Plessis (2013: 54) the model was insufficient and was brought to schools in considerably diluted form. Equally, Motala et al. (cited in Rembe (2012: 16) noted that irrespective of these advances, insufficient time is still a problem in teaching and learning, and the challenge of accessing enough books and appropriate materials still features particularly in remote schools.

2.3.2.3 Curriculum assessment policy statement (CAPS)

To improve implementation of the curriculum policy, the national curriculum statement was amended to be in effect from January 2012. This modification replaced the national curriculum statement Grade R - 9 (2002) and the national curriculum statement Grade 10 - 11 (2004). This policy contains a single broad document of the national curriculum and assessment policy statement which was developed for individual subjects to take the place of the prior subject statement, learning programme guidelines and subject assessment guidelines in grade R - 12.

The national curriculum statement grade R - 12 (2012) is a policy statement for teaching and learning in South Africa schools. New documents comprising the national curriculum have to be presented to all schools, district offices and to parents by means of print and digital media (Du Plessis, 2013). This document is made up of the national curriculum and assessment policy statement for the entire approved subject. The terms 'learning outcome' and 'assessment standard' are not used anymore and 'learning areas' are now known as 'subjects' (Foundational Phase CAPs, 2012).

The policy is premised and based on the principles of social transformation which is to ensure that the imbalance witnessed in education in the past is rectified and every part of the population

receives equal educational opportunity. The policy values indigenous knowledge, human rights and inclusivity (Foundational Phase CAPS, 2012).

2.3.2.3.1 The aims and purpose of CAPS

The national curriculum statement grade R - 12 aims at producing learners that will be able to identify and solve problems, make decisions based on critical and creative thinking, and be able to work autonomously and cooperatively with others as a team member. The aim is to build responsible learners that are well organised and able to manage themselves. CAPS aims to develop learners that are able to collect, organise, analyse and evaluate information, communicate effectively using symbols, visual and language skills in several modes. Such a learner will effectively use science and technology and demonstrate responsibility toward the environment and health of others understands that problem solving does not exist in isolation (Foundational Phase CAPS, 2012). De Clercq (2014: 313) indicated that introduction of CAPS was to correct the poor content description in the former version of the curriculum which allowed teachers to decide what to cover on their own in order to meet the learning outcomes for each grade.

The purpose of the national curriculum grade R - 12 (2012) is to develop all learners with knowledge, skill and value which is necessary to be self-fulfilling and to be able to engage fully in society as a free citizen regardless of socio-economic status, race, gender, physical and intellectual ability. The purpose of CAPS is to provide learners access to higher education and to facilitate learners' transition from educational institution to workplace and to provide employers with learners that are competent (Foundational Phase CAPS, 2012). However, De Clercq (2014: 313) observes that CAPS terrified countless teachers with the range or extent of curriculum scope as it was the first time teachers were clearly instructed on what to cover. Du Plessis' (2013: 57) findings indicate that teachers need to be better furnished for them to be able to efficaciously implement CAPS, and she further comments that DBE needs to advance their strategy on implementing changes to ensure that new policy documents do not remain a policy only but are implemented.

2.3.2.3.2 Inclusivity

The national curriculum statement grade R - 12 (2012) demands that inclusion should be the central part of all organizing, planning and teaching in all schools (Foundational Phase CAPS). What is inclusion? Inclusion can be describe as the approach of accommodating all people ranging from able to disabled, haves and the have not, and different kinds of people in society, so that they can partake and enjoy equal opportunity and quality education without being discriminated against.

Inclusion approach is different from the former traditional approach that belief learning barrier is resided within the learner and learner should be given support base on medical intervention (Vogel, 2011: 2). Dyson; and Ainscow (cited in Landsberg et al. (2011: 4) describe inclusion as a principle committed to building a more democratic society, to build an equitable and quality educational system, and the that regular schools are responsible to accommodate different learning needs of all learners.

According to foundation Phase CAPS (2012) inclusion will only take place if all teachers have the ability and sound knowledge of how to identify and address barriers to learning and how to handle diversity. Engelbrecht et al. (2007: 71) indicate that to give support to learners requiring special needs, teachers are required to be thoughtful toward the specific needs of each learner including their own feelings and attitudes. The ability to manage diversity requires sound knowledge and resourcefulness. Teachers need to have understanding and be sensitive to issues such as segregation, inequality, prejudice and stereotyping and their influence in the education arena.

The inclusive approach requires teachers to accommodate all learners and those who face challenges in their learning and development in their classroom (Vogel, 2011: 4). This involves regular schools meeting all learning needs of their learners and limiting any sort of barriers to learning, moving toward a society that believes in justice for all its citizens (Landsberg & Gericke, 2006: 22). The key to managing inclusivity is to ensure that barriers are identified and addressed using all relevant means of support structures within the school community which includes teachers, district based support teams, institutional level support teams, parents and special schools as resource centres (Foundation Phase CAPS, 2012). CAPS specify that in addressing learning barriers, teachers should make use of various curriculum strategies like those in the Department of Basic Education (DBE) guideline for inclusive teaching and learning (2010).

2.3.2.3.3 Gauteng primary languages and mathematics strategy

When President Jacob Zuma of South Africa in 2010 identified that the achievement of primary schools is the national priority and targets were set for the Department of Basic Education to make sure that 60% of learners performed at grade level by 2014 on the ANAs for Grades 3 and 6, the Gauteng Department of Education embarked on appropriate initiatives (Fleisch & Schoer 2014: 1). The most significant of these, according to Motala, Morrow and Sayed (2014: 22), was the 2010 Gauteng Primary Language and Mathematics Strategy (GPLMS).

The GPLMS is a plan that to improve language and mathematics in schools that are performing poorly in Gauteng Province. De Clercq (2014: 315) defines GPLMS as an intervention designed to

promote new teacher practices and better learner results in primary schools in Gauteng that are performing badly. Fleisch and Schoer (2014: 1) describe the GPLMS as a large scale innovative reform designed to advance the outcomes of learning. The strategy was first introduced to the foundation phase (grades 1 – 3) and was later expanded to the intermediate phase (grades 4 – 7). According to Creecy, the education MEC in Gauteng Province, the expansion of GPLMS will include 811 priority schools, which are schools that achieved less than 60 percent in the 2010/2011 Annual National Assessment (ANA).

Creecy stated that educators in grades 4 - 7 will receive lesson plans for each term and quarterly learner assessments. This will help reduce their workloads and enable them to spend quality time with learners. The lesson plans and the assessment are in compliance with the CAPS and national assessment policy. The intervention strategy involves provision of lesson plans that include activities, marking guides and recording tools, integrating the content and assessment requirements of CAPS into a structural form which contains everyday programs. This is the only lesson plan that is required to be used in the GPLMS schools in mathematics and language (GPLMS Assessment Circular, 2012). According to Fleisch and Schoer (2014: 2) the development of the GPLMS strategy was premised on five basic principles: firstly, the strategy must be feasible and affordable for the province to manage; secondly, it requires the total commitment to partnerships; thirdly it requires continuous vibrant inner monitoring and outer evaluation to direct the progression of the project over the time; fourthly, foster coherence and alignment with policy and other programs from the provincial and national government; fifthly, recognition that the long term workability of the initiative is reliant on the learning of the teacher.

De Clercq (2014: 303) states that in the past departments of education and educationists have developed numerous interventions to promote teaching and learning quality but regrettably former interventions were hardly well taken which hindered these from producing substantial progresses in school performance. De Clercq (2014: 303) goes on to say that, regarding the GPLMS, the quality of supportive learning materials, the lesson plans and the provision of coaching, appear to be a well formed and well calibrated intervention for improving learners' results. GPLMS blends together on-going support and slight pressure to stimulate new pedagogy practice and advancement of learners' performance (De Clercq, 2014: 315). However, Motala, Morrow and Sayed (2014: 32) caution that the autonomy of provincial departments is severely limited. The Gauteng Department of Education may develop innovative means to a shared goal but they are basically implementing agencies which must work within the boundaries of policies set by the national department in Pretoria, not in the provincial headquarters in Johannesburg.

Even though De Clercq (2014: 315) commended GPLMS for serving as a positive form of intervention for schools that are underperforming the author argues that GPLMS presents three conceptual flaws: firstly, it reflects top-down decision making which springs from the MEC to teachers of the supposed nonperforming schools without properly consulting the schools, districts and unions. Secondly, the postulation that teachers need to train for 'better knowledge-in-practice', which the lesson plans and coaches are promoting. Thirdly, the strategy has adopted a generic 'one size fits all' approach for improvement of nonperforming primary schools.

2.3.3 Instructional medium

The educational domain basically depends on language which is the vehicle that carries all instructional activities. However a breach in instructional medium will obstruct the advancement of teaching and learning. Language barrier in mathematics learning features across the globe especially in situations where the official language of instruction happens to be the second or third language of the learners, a situation which poses serious challenges to pedagogical practice. Winsor (2007: 372) points out that teachers of English language learners (ELL students) in the United States are faced with challenges in mathematics teaching and even those teachers that are bilingual are challenged with the daunting task of effectively teaching mathematics. The National Education Association (NEA) policy brief NEA (2008: 1-2) on English Language Learners identifies that ELL teachers lack the practical knowledge, research based information, resource materials and strategies needed for teaching, evaluating and nurturing their students. Setati, Adler, Reed and Bapoo (cited in Adler and Reed (2002: 79) comment that teachers are facing competing and complex tasks in the multilingual classroom setups in the South Africa environment. They argue that teachers are expected to embrace an additive approach to multilingual learning, deal with the popular preference for English access, enable exploratory talk which should habitually occur in learners primary language or in both their primary and instructional language, and at the same time provide learners access to discourse-specific subject knowledge and specifically give assistance to learners in developing formal spoken and written in English. Setati et al. concluded that pedagogical practice and politics are inextricably interwoven and have the potential to pull classroom practice in a competitive and contradictory manner (Adler & Reed, 2002: 79). Similarly, Vandeyar (2010: 922) states that desegregation of schools in the country allowed schools to cater for multiracial learners however most teachers in these schools finished their teacher training with the mind-set of teaching a mono-racial set of learners in their home language (teachers language) usually Afrikaans or English. However given the shift in education they have to face the challenge of teaching diverse race and language groups. A study by Connor and Geiger (2009) revealed that teachers are faced with several challenges when

instructing English Second or Other Language (ESOL) learners and apart from academic and socio-emotional difficulties of these learners, the educators that participated in their study were exasperated by the substantial load of work and large sizes of classes fill with ESOL learners.

According to Setati, Adler, Reed and Bapoo (cited in Adler & Reed (2002: 73) mathematics and science teachers are facing double challenges in classes because while their learners are still learning the English language, they are being taught in that language. And they indicate that, most textual resources used in teaching and learning in South Africa schools is printed in either Afrikaans or English even though these two languages are the main language of few teachers and learners. Many teachers teach in a school environment that uses English as the official language of instruction although this is not the primary language of the teachers and their learners (Adler & Reed, 2002: 73). Fillmore Wong (1984) points out that multilingual school teacher often meet their instructional obligation by opting to instruct their students with simplified language. However, Adler (1997) and Valdes (cited in Gorgorio & Planas (2001: 15) caution against such a practice, because teaching with a simple version of the official language of instruction does not provide learners the assurance of accessing superior mathematics content and this process may impede their acquisition of rich concepts in mathematics.

South Africa's language policy stipulates eleven official languages. The constitution of South Africa (1996, section 29) emphasizes the right of every child to receive education in any of the eleven official languages in public schools of their choice. The democratic government and the Department of Education vigorously encourage multilingualism (Vandeyar, 2010: 922), and all the official languages are given same status (Mwanwenda, 2004: 152). South Africa is a multi-lingual society; the governmental policy on language tends to integrate the major languages into educational provision to accommodate its citizens. According to Beukes (2004) "The constitution enshrines linguistic plurilingualism". However, Lemmer and Van Wyk (2010: 119) indicate that multi-linguist presents a serious complication in educational provision in South Africa. They maintain that the indigenous languages are imperfectly developed for use as a school medium due to lack of terminology and resources. Connor and Geiger (2009) point out that the policy on language is only partly implemented, and as a result of incomplete implementation of the policy, educators in South African are faced with the challenge of having numerous numbers of English second other language (ESOL) learners in their classrooms (PANSALB, 2000 cited in Connor & Geiger, 2009). South Africa school language policy emphases learning of two languages in a multi-lingual society The policy requires children to be competent in first additional language (FAL) while maintaining their home language (Department of National Education, 2002). Chick and McKay; and The Advisory Panel on Language

Policy (2000, cited in Connor & Geiger, 2009) state that the language policy takes an additive approach to the language issue which permits learners to retain their first language and use it as the basis for learning other languages. According to Lenyai (2011) such an approach assumes that children start school with competency in their home language and are able to use it as a basis to learn an additional language. Lenyai continues that since the approach is based on assumptions not on proven facts this approach must be handled with care and not influence teaching.

Akinnaso (cited in Mwanwenda (2004: 152) maintains that education through the medium of mother tongue promotes cultural transmission, development of cognizance, growth and ability to communicate. The inter-African Bureau of language also advocates the importance of mother tongue instruction in school. The organisation emphasises that mother tongue medium helps children develop critical thinking power, promotes communication skills and fosters deep understanding of culture (Herbert, 1992). Research has proven that without adequate development of home language learners that receive instruction through FAL are likely to face academic challenges (Lemmer and Van Wyk, 2010: 226). The research of Dowe, 1983; cited by MacGregor & Moore (1991) endorses the potency of home language on academic performance. The research reveals that bilingual children whose mother tongues are well developed perform excellently in mathematics problems that require deductive reasoning compared to their monolingual peers. His work also shows that children with less developed home language perform poorly in the same test.

However while efficacy of mother tongue in educational provision is widespread, the high esteem for English and the negative social sense attributed to Africa language in society results in a strong preference for English as instructional medium (Webb, 2004). The school language policy in South Africa adopted and inculcates mother tongue instruction in school from grade R - 3 and at the fourth grade it is replaced by English or Afrikaans in most schools (Vogel, 2011). The transition of instructional medium from mother tongue to English at the fourth grade poses a complex dilemma for both teachers and learners, while most learners are not at the readiness stage to receive instruction in what they refer to as a foreign language. Webb (2004) indicates that English acts as a hindrance to the development of education because the English proficiency of South Africa black learners is mostly insufficient for them to receive instruction in such. According to Lenyai (2011) if children cannot comprehend English, they won't be able to communicate in English; children who can't communicate will find it hard to read and write proficiently because one must develop speaking before reading, likewise it will be difficult for them to decode textbooks written in the English language. Many teachers are not well equipped to comfortably carry out instructional activities in English which is a problem because, as Lenyai (2011) points out, the key to achievement

of the literacy goal in English depends on the expertise of the teacher. However, Robin (cited in Mwanwenda (2004: 152) indicates that English is seen as crucial in South Africa as it relates to education, social, economic drive and esteem, which make most schools opt for the language despite the non-proficiency of teachers and learners in such language. The situation is serious in remote area schools and informal settlement schools where English is sparsely used both at home and outside the home which results in most teachers sticking to mother tongue instruction while claiming to switch code.

Although switching of codes allows indigenous languages to be used during formal instruction to facilitate understanding of learners, the reality is that the majority of teachers in remote areas are not competent to instruct in English or FAL. Code switch, according to Gorgorio and Planas (2001: 14), is more than sheer translation; it's far more than just a switch from first language to instructional language which means that not just a word needs to change but its meaning and the manner in which it is used. Lenyai (2011) avers that there is a huge difference between African languages and English so the idea of changing from one language to the other does not appear useful, unless the meaning can remain the same. Gordon (1989: 77) contends that teachers are not assisted on the method to use when changing the language of instruction from home language to English. Adler and Reed (2002) add that subject of how both teachers and learners are to traverse from casual spoken language (that is, learners' main languages) to official language is not addressed in the curriculum. Donald, Lazarus and Lolwana (1997) argue that in a situation where no students or teachers are competent and comfortable with the use of an additional language as a mean of instruction, the situation can influence the quality of teaching and learning negatively.

Fillmore Wong (1984) argues that students cannot get full benefit from instructional practice in their classroom except if they engage in the transactions that transpire in the class, for which they need to be able to comprehend the conversation and be able to respond with their own thoughts, or else the instructional activity will not go well. Ormrod (2001) states that, the transition of instructional practice from home language to English instruction happens gradually over some years and ordinary knowledge of basic conversational English (also referred to as basic interpersonal communication skills [BICS]) is not adequate for academic achievement in an English only curriculum. Substantial research evidence has proven that it takes about 2 years for a child to acquire an additional language in order to use it but for a child to be able to receive academic instruction with that language it will take about 7 years (MacGregor & Moore, 1991). For a child to achieve academically, Cummins (1989) maintains they need to be proficient in both BICS and cognitive academic language proficiency (CALP) in the two languages which are required for school learning. BICS is the language aspect that

enables learners to fluently and effectively communicate, while CALP is the language aspect that permits the mastering of school work. According to Fillmore Wong (1984), for students to learn effectively in school, they need to acquire the skills in a language that will enable them meet the cognitive demands and that will allow them to participate in the variety of social interaction that transpires in their classes. Vogel (2011: 45) notes that language skills result from development of cognitive (mental) structures, and the cognition growth order and quality of a child will therefore dictate the child's language development order and quality.

Gorgorio and Planas (2001: 30) propose that the instructional practice of mathematics should aim at facilitating student movement from exploratory talk to discourse-specific talk, but they argue that knowledge on how this movement should happens is yet to be completed. Although Setati et al. (cited in Adler & Reed (2002) acknowledge that this movement is complicated, they suggest possible ways to follow that will facilitate the movement. Gorgorio and Planas (2001: 31) call for more research on how language in mathematics can be taught and for research that will investigate the relationship in language of math classes, mathematics language and the process of constructing knowledge in mathematics.

2.4 TEACHERS RELATED FACTORS THAT CONTRIBUTE TO CHALLENGES IN TEACHING MATHEMATICS TO LEARNERS EXPERIENCING BARRIERS

2.4.1 Inability to identify barriers that obstruct mathematics learning

Before the teaching of any mathematical concept, it is crucial to identify the learners' level of understanding and the previous knowledge they have acquired in order to determine which point to start from. The necessity of diagnosing the exact barrier that hinders learners from performing in mathematics cannot be ignored and early identification will help to enable the necessary action to remediate the condition. Geary (2004, in Cross et al., 2009) noted that more than ten percent of children battle in one or two mathematics contents areas at some point in their schooling career. Early knowledge of barriers that hinder learning helps to address the issue before it degenerates into a more complex situation. Mathematical barriers should be identified and corrected at the foundational phase of learning. Children at this stage are tender and flexible; the flexibility of young children makes it easy for them to adapt and respond to any changes, which might not be too easy for learners when they get to advanced phases. Early identification facilitates progress and enhances potential development of learner which promotes cognition so the learner has a greater chance of improving and overcoming the barriers.

The responsibility of teachers in this current educational shift is to attend to the diverse needs of their individual learners including those experiencing barriers their class. It is proposed in the inclusive education policy that learners who experienced barriers to learning should participate fully as school community members and should be provided with quality education through effective teaching and given all necessary support (Landsberg et al., 2011: 75). Mkhuma, Maseko and Tiale (2014: 450) point out that not only do teachers experience challenges in executing the inclusive education policy in South Africa, they also experience typical challenges regarding identification of learners who are experiencing learning barriers. They argue that this challenge is a major obstruction to delivery of the appropriate support required to address learners' needs (Mkhuma et al., 2014: 450). Notwithstanding, evidence has proven that in circumstances where teachers are given support to identify and interpret the learning needs of their students, they will be well informed about where to start their teaching and will be better able to scaffold their students' mathematics learning (Clarke cited in Siemon, 2009: 223).

In addressing learning barriers in mathematics teachers need to acquire the necessary skills. As mentioned previously that for teachers to support learners that require special educational needs, they have to be sensitive to the actual needs of the particular learner Engelbrecht et al. (2007: 71).

Teachers' understanding of learning support will guide the selection of assessment tools and plans (Landsberg et al., 2011: 53). However, Mkhuma et al. (2014: 444) note that most teachers are challenged in this because they lack knowledge of various difficulties in learning plus lack of guidance in using the strategy of Screening, Identification, Assessment and Support (SIAS). Ntsanwisi (cited in Mkhuma et al, 2014: 444) states that lack of skill using SIAS makes it hard for teachers to handle diversity in their classes. Engelbrecht et al. (2007) believe that teachers may require training on ways of identifying and addressing special needs in education. The DoE (2005) has stated that if educators are the chief players in the course of identifying and addressing barriers to learning, then they require training on what are barriers to learning, and ways of identifying them. Similarly, Mpya (2007: 105) avers that teachers need training regarding contextual background of barriers to learning, the causes of barriers, particular curriculum to follow, content and materials to use, teaching strategy to employ and ways of averting barriers learners are experiencing.

Assessment tools are a good technique for identification and diagnosing learning barriers in mathematics. Educational assessment helps to determine barriers and monitor learner's performance to gather information regarding their strengths and weaknesses; this will enable teachers to decide on the appropriate teaching strategies and invariably reduces stress during the teaching process. It has been acknowledged that teaching which is informed by quality of

assessment improves learning outcomes (Ball, 1993; Black & William, 1998; Masters, 2004 cited in Simon, 2009: 223). The assessment principle of the NCTM identifies that assessment is essential to mathematics teaching and learning (NCTM, 2000 cited in McKinney et al., 2009: 280). For assessment to yield an effective result it should be carried out on a continuous basis. Assessment should be conducted before, during and after support has been given to learners. Assessment should centralize on assessment for learning rather than assessment of the learner because the process of assessment for learning involves efforts to improve learning so as to meet the learning needs of learners (Carl, 2009: 103).

The South Africa's national strategy related to SIAS endeavors to change the approach of learner's assessment which mainly focuses on achievement to one that enables constructive support for the learner (Landsberg et al., 2010: 52). At present the focus of assessment is shifted toward assessing for learning rather than assessment of the learner (Carl, 2009: 103). This shift enables teachers to generate quality data that will inform their decisions regarding appropriate support strategy. As stated by Landsberg et al. (2011: 52), this change in the perception of assessment is very important especially when teachers deal with learners that experience difficulty in their learning. The challenge posed to teachers is that they need to focus beyond the assessment on learning support that will address the particular needs of learner experiencing barriers (Landsberg et al., 2011: 53).

2.4.2 Manifestation of barriers to learning mathematics

Learners experiencing barriers in mathematics exhibit their inadequacy in numerous ways. Landsberg et al. (2011: 221) point out that most problems in mathematics begin in learners early school years, but they can also develop at later stages. Machaba and Mokhele (2014) observe that a great number of learners have difficulty in carrying over units to tens and tens to hundred. Equally, Landsberg et al. (2011: 222) and Vogel (2011: 220-221) see that learners experiencing mathematical difficulties display various problems such as counting problems, place value problems, the inability to use number lines, lack of understanding of the concept zero, difficulty in discriminating +, -, *, and /, do not understand the = sign, carry out different computation in the same manner for instance, $4+3=7$, $2*5=7$, $6-4=10$, and $8/2=10$, and many more.

A study by Machaba and Mokhele (2014: 388) revealed that grade three learners from underprivileged schools in Tshwane South District area were unable to carry out basic operations in mathematics; they indicated that these learners lack the knack to execute computations such as addition, subtraction, multiplication and division. Similarly, Schollar (cited in Venkat (2012: 114)

found that in arithmetic operations learners battle to shift from concrete technique to abstract technique in counting relating to carryover/borrowing.

The above barriers and their manifestations have significant impact on teaching and learning. The new educational shift in terms of an inclusive educational system requires teachers to support all learners experiencing these barriers and include them in class academic activities. Van Zyl (cited in Maya (2007: 17) argues that in practice overcoming learning barriers might not be possible, yet learners can be assisted to benefit and be included in the classrooms. Engelbrecht, Swanepoel, Nel and Hugo (2013: 34) claim that multi-level teaching (an exact form of differentiation) will help teachers manage inclusion of learners experiencing barriers. Curriculum differentiation is described as the prime stratagem which enables response to needs of learners with diverse learning styles and needs; it entails the process of modification, change, adaptation, varying and extension of methods of teaching, strategy, assessment techniques and curriculum content (Engelbrecht, Swanepoel, Nel & Hugo, 2013: 36-37).

2.4.3 The competency of elementary school teachers; the issue of teacher training regarding pre-service and in-service programmes

According to Adler and Reed (2002: 3) the challenges facing pre-service and in-service programmes are multidimensional. Harper and Daane (1998: 29) acknowledge that many elementary teachers lack boldness in using mathematics; they start college with anxiety toward the subject and this leads to development of beliefs and attitude about mathematics and learning of mathematics which contradicts the standard of NCTM. Hilton (cited in Harper & Daane (1998: 30) maintains that the elementary classroom is the root cause of anxiety in mathematics in some students. Teachers' authoritarian style and lack of mathematics mastery, over dependence on rote calculation and memorisation with the use of applications that are not realistic are factors considered to cause mathematics anxiety among students. Likewise, Harper and Daane (1998: 30) state that the common practices that cause anxiety are too much emphasis place on drill and practice, application of rules, memorisation of formula and an emphasis on the use of right methods and getting the right answer.

Inadequate knowledge of subject content contributes greatly to challenges when addressing barriers in mathematical learning. Teachers' level of knowledge has significant impact on their students. Teacher with a high level of mathematics understanding provide qualitative learning opportunities to students compared to those with low level understanding. (Mandeville & Lui cited in Grootenboer & Jorgensen, 2009: 256). Ozola and Purvins (2013: 135) point out that teaching and learning in the classroom is a concurrent procedure, the actions of teachers generate student learning. Hill, Rowan,

and Ball (2005: 371) found out that the mathematical knowledge of teachers predicted student attainment of mathematics all through their first and third grades. Carpenter and Fennema (cited in Siemon, 2009: 225) indicated that teachers' belief, knowledge and surveillance of their learners' behaviour as they react to learning situations formed their teaching decisions. Feiman-Nemser (2001: 1013) stated that what students learn is largely dependent on what and how teachers instruct them, and teachers instructional practice depends greatly on their skills, knowledge and how committed they are to their teaching and the professional development opportunities they have. According to Siemon (2009: 222) effective teaching rests mainly on teachers understanding of their learners which include the understanding of their recent misconceptions, belief and knowledge. However, if teachers are to operate in this manner not only must they understand their subject matter they must also have understanding of how their students learn the subject. Palacios (cited in McKinney et al. 2009: 278) stated that teachers who are not using best practices or those that are inexpert in using such are most likely not to endeavour reaching out to all their students learning needs or adjust their pedagogy practices. Generally it is acknowledge that teachers quality is the most significant factor that affects student performance in general (Ball, Rowe, Hattie, Mellor & Carrigan cited in Siemon, 2009: 222). The impact that a well-equipped teachers has on learners is more than the effect that any background factor such as poverty, language and minority status (Darling-Hammond in Siemon, 2009: 222) may have on their learning.

Goudling, Rowland and Barber (cited in Grootenber & Jorgensen (2009: 256) argue that poor subject knowledge is associated with weakness in planning and teaching of mathematics at the primary level. The National Commission on Teaching and America's future (1999, in Feiman-Nemser, 2001: 1013) acknowledges that "what teachers know and can do makes the crucial difference in what teachers can accomplish". According to Feiman-Nemser (2001: 1013) the quality of a nation's schools is dependent on the quality of the nation's teachers. The study of Lester (cited in Harper and Daane, 1998: 29) reveals that the mathematics understanding of many elementary teachers is weak compounded with the negative attitude and anxiety they have toward the subject. However, this variance can be traced back to the educational training (pre-service training) most teachers received. In the South African context, for instance, the provision of education in the previous dispensation was fragmented and characterised by inequality and disparity (Lemmer & Van Wyk, 2010: 247). Gordon (1989) pointed out that low quality training which is deeply entrenched in inadequate education leads to poor conceptual understanding of mathematics. Adler and Reed (2002) add that South Africa was long characterised as unequal, inefficient, fragmented, and segregated, with bureaucratic control of curriculum, institution and governance. Hofmeyr and Pavlich (cited in Gordon, 1989) maintained that Christian national education and fundamental pedagogies influence

training of teachers in South Africa and these educational philosophies strengthened the authoritarian conservative teaching which was practiced.

2.4.3.1 Inadequate Pre-service training

Teachers' education and pedagogy are professional practices that are multifaceted which can be mentally visualised in several ways and hitherto provided diverse effects for teacher learning (Wang, Spalding, Odell, Klecka & Lin, 2010). Teacher education training sets the pace for the prospective teacher to competently deliver in the classroom but inadequate preparation of teachers during their teacher education programme has led to incompetency in most classrooms in this contemporary time. Berns and Swanson (2000: 14) are of the view that insufficient preparation in subject content in teacher educational programmes leaves new teachers poorly equipped to be involved in the complex procedures required in inquiry focused instruction. Ozola and Purvins (2013: 133) argue that teachers' obligations are not to concentrate on teaching content only but also to guide their students into cultivating the skills of lifelong learning. Awuor (2013) proposes that teacher preparation programmes may be at the root of lack of quality teachers. A study by Polat (2010: 239) revealed vital differences between pre-service and in-service teachers' beliefs regarding self-competence and readiness. The results further reveal that pre-service and in-service teachers feel ill-prepared, not ready and they are inadequately competent in content to meet the language and academic requirement of their ELL students in their mainstream classrooms. Ng, Nicholas and Williams (2010: 279) acknowledge that it is important for teacher educators to comprehend the knowledge view which student-teachers come to their teacher education programmes with which will enable them to assist students in cultivating insightful professionalism.

Future teachers need to experience the similitude of their real work practice in order to cope in the professional field. It is realised that most pre-service programmes only provide limited practical experience for student teachers. Moore (2003) acknowledges that experiences in the field have a huge potency to provide future teachers with the privilege of practicing decision making on instructional activities and reflective practice. According to Droppert (2013: 103) community service experiences of pre-service teachers foster good interaction in preparing them for working in diverse classroom settings. The post survey findings of Droppert display positive results from outing experiences of pre-service teachers, Droppert (2013: 103) suggests outing experience where pre-service teachers meet people one on one to gain experiences that prepare them to cope in diverse schools and for development of skills and civic literacy in the 21st century. Wang, Spalding, Odell, Klecka, and Lin (2010) point out that certain questions have not been sensibly mentally visualised or

meticulously studied in pedagogy and the teacher educational field. Such questions include: What is teaching practice? What are its developmental patterns and characteristics? What is the role of practice in teacher learning and development?

According to Grootenboer and Jorgensen (2009: 256) many pre-service teachers enter teacher education institutions with considerable levels of anxiety regarding mathematics as a subject. The Asia Society (cited in Awuor (2013) state that the quality of an educational system cannot surpass the teachers' quality neither can pedagogical quality go beyond the quality of the system. Harper and Daane (1998: 34-35) found that anxiety in mathematics stemmed from instructional practices of classroom structures which are rigid coupled with too much emphasis placed on right answers which create pressure for students. They also they indicate that teachers' practice of creating embarrassment for students in their classes due to the way students ask or answer questions, and undue emphases on test and grades can led to many anxious situations. These states of anxiety build up a negative belief directed toward mathematics. Thompson (1984: 105) maintains that the opinion, belief and choice of teachers relating to the subject matter and their pedagogical styles contribute greatly to influencing their effectivity as mediators between their learners and the subject. Similarly Ng, Nicholas and Williams (2010: 278) state that the beliefs of teacher are the philosophies which impact how they conceptualise their instructional practice. The belief held regarding one's professional career is very substantial and cannot easily be changed. Johnson (2006) states that the most common problem connected to the inability of teachers to change their beliefs system relating to how science ought to be taught goes back to the way they were taught and what they experienced as learners. Therefore Ng, Nicholas and Williams (2010: 288) advise that educators of teachers ought to be relating student-teachers' beliefs to their learning needs in order to help them improve their pedagogical ability.

2.4.3.2 In-service training

According to Chamoso, Caceres and Azcarate (2012: 154) teachers are regarded as an extremely significant element in the process of teaching-learning and as they are educating the upcoming generation in society. For teachers to perform their responsibility and deliver to the best of their capacity in this dispensation upgrading of skills is non-negotiable. Changes in societies and economies over the past four decades require more duties from teachers demanding diverse knowledge and proficiencies (De Clercq, 2014: 304), which necessitates development of teachers in their skills. Continuous development of professional careers is necessary due to the various innovations and developments springing up in the world today and having an influence in the

educational domain in one way or another. These developments precipitate changes in pedagogy practice and without on-going professional training teachers will be out-dated and incompetent to manage their current academic activities and meet the challenges in their regular classes. Du Plessis (2013: 55) avers that on-going professional training development of teachers is good for the welfare of any educational system. Professional development as described by Awuor (2013) is the on-going support and educational training teachers get on the job to update their skills, knowledge and attitudes. As described by De Clercq (2014: 304), professional development is a way of developing teachers' ability and agency aiming to improve teaching and learning and the performance of learners.

On-going professional development is a practice that should last for the whole career of the teacher (Du Plessis, 2013: 55). The training needs to be specific, technical and should address areas of teachers' pedagogical challenges (Awuor, 2013). According to Welch (cited in De Clercq (2014: 304), if the focus of teachers' professional development is not based on links that exists between teacher skill and knowledge and student learning, it cannot be regarded as worthwhile. Carl (2009: 215) emphasises that in-service training plays an important role in contributing to the competency of teachers and assists them to master the applicable skills. However, Berns and Swanson (2000: 14) point out that the leadership providing quality continuing professional development at the district level is limited.

Adler and Reed (2002) point to the complex expectations placed on teachers – they are to teach new knowledge in fresh ways, and participate in continuous learning relative to their professional proficiency. Teachers are expected to develop highly skilled learners and play a vital part in eliminating the social ills and disparities that learners come to classes with. Chamoso, Caceres and Azcarate (2012: 154) noted that currently a lot of attention is focusing on competence of teachers as an aspect that dictates quality in mathematics teaching. Without adequate continuous professional training which addresses the needs of in-service teachers they will remain unskilled in their profession to meet the demand of new developments and innovative changes.

2.5 ATTRIBUTES OF LEARNERS THAT INFLUENCE THE CHALLENGES IN TEACHING MATHEMATICS TO LEARNERS EXPERIENCING BARRIERS

2.5.1 An overview of barriers to learning mathematics

Barriers to learning are obstacles that obstruct successful learning which are also challenges to pedagogical practice. According to the DoE (1997: 12) barriers to learning are factors which result in

failure of educational system to accommodate diversity, leading to learning breakdown or hindering the learner from gaining access to provision of education. Nel (2014) observes that although there are vast numbers of learners in regular schools who do not experience disabilities, barriers to learning do exist including language barriers, socio-economic barriers, poorly trained teachers and so on. Friend and Bursuck (cited in Mahlo (2011: 77) indicate that learners experiencing learning disabilities accomplish less than others due to their inability to process, organise and integrate academic information.

If these barriers are not properly addressed this may lead to grade retention, school dropout, and non-achievement in life. Cross et al. (2009) state that, the effect of weakness in early mathematics if not attended to may be felt throughout the school years and even beyond school. The barriers learners faced in mathematics which also pose a challenge to successful teaching of the subject can be categorized as intrinsic and extrinsic barriers (Landsberg, Kruger & swart, 2011: 217). Below are detail descriptions of those barriers.

2.5.1.1 Language barrier to learning

One major issue to consider when discussing barriers that hinder successful teaching and learning of mathematics is the language of formal instruction. Language is an important factor in the teaching and learning situation, it is indispensable and the dominant tool of delivery of all lesson instruction to learners. Language is part of people; it features in all cultural settings and fosters interaction and socialisation. According to Ochs and Schieffelin (1986) language is an important resource which helps people understand the way cultural knowledge and beliefs are transferred from one generation to another generation. The Department of Education (2002: 5) acknowledges that our knowledge and identity is shaped through the means of language. Language helps us express our ideas and communicate our thoughts. The essentiality of language in education and the role language plays in teaching and learning cannot be underestimated. Language deficiencies can hamper academic progress which can frustrate the teaching and learning process.

The language practices learners come to school with will inevitably have an impact on how and what they learn (Nieto cited in Gorgorio & Planas, 2001: 10). Gordon (1989: 77) identifies the main language barriers learners experienced in learning mathematics as terminology of the subject. He states that these challenges stem from the issue of diverse conventions for names of numbers which result in confusion for teachers and learners. He also points out that children have a greater knowledge of number names in English than in the vernacular before they enters school, but then this is hindered because they have to learn mathematics using their home language in the first

grade. According to Piaget in Vogel (2011: 45) babies don't possess intricate language structure from birth, they need to develop it. Notably learners need to understand the medium of school instruction for them to comprehend and process all academic information in their learning process. Niemand and Monyai (2006) argue that learner's potency to learn and think rely fundamentally on their ability to understand language.

Although the effectiveness of mother tongue instruction has been agreed on in general (Lemmer & Van Wyk, 2010: 119), many South African students are not really fluent in their own language (Howie cited in Vandeyar, 2010: 923). According to Lemmer and Van Wyk (2010: 226) English second language learners whose mother tongue languages are insufficiently developed are not likely to accomplish academically.

2.5.1.2 Poor quality teaching

Poor quality teaching accounts for most failures and poor performance in mathematics by learners, and is one of the major reasons many learners develop hatred for the subject. According to Vogel (2011) and Westwood (cited in Landsberg et al. (2010) poor quality teaching impedes understanding and proficiency of mathematics concepts. Good teachings necessitate and promote development of mathematical concepts. The only way to achieve this is for teachers to possess solid knowledge of contents and pedagogical knowledge of the subject. According to Vogel (2011: 214) some teachers' knowledge of mathematics is inadequate and they have limited insight into the subject concepts. Excellent mathematics teachers have a grounded knowledge base to draw on in all aspects of their professional work which includes solid knowledge and an appreciation of mathematics that is suitable to the grade level they teach (Reys, et al. 2012: 37). It is necessary for teachers to have a great deal of mathematics knowledge, able to interpret and supplement texts in teaching and help students develop productive thinking by asking relevant questions and providing clear and insightful examples. Teachers must be prepared to answer offbeat questions, challenge the strong students and make provision to assist the weaker ones (Krause, 1978).

Reys et al. (2012: 38) argue that teachers who have grounded content knowledge are able to build their students' understanding of mathematics concepts and they allow questions and comments from students because they are confident in their own ability. Research by Glennon (1981) found that generally mathematics teachers only have half of the mathematics they are teaching children in grade K-6 and special education teachers had even less knowledge of mathematics and instruction. Likewise Fleisch (cited in Venkat, 2012: 107) pointed out that proof from a series of current studies indicate that South Africa has challenges in teaching and learning of mathematics at the primary

level. Parker (cited in Vogel, 2011: 214) pointed out that teachers who lack mathematics understanding and who are not acquainted with it, will not know the current technique of teaching it. Glennon (1981) avers that you cannot adequately teach what you don't understand well; a teacher can successfully teach the rationale of an algorithm for dividing decimal by decimal if he or she has understanding of the mathematical processing of the numerals but if their understanding is tied to a mechanical procedure that was learned without understanding, the teacher can only teach in a nonmathematical way which is low in standard.

The general contributing factor to poor teaching in mathematics is limited time allocated for teaching while learners have little time to learn the subject. There is no time to illustrate the concepts and processes clearly and the teaching strategies are not appropriate (Westwood cited in Landsberg et al., 2010: 218). As Schultz et al. (1989: 10) put it, the general goal of teaching has been neglected and teaching has become technical and behavioural – the focus is now on task analyses which are particular steps required to carry out a task without promoting activity that enables understanding and the ability to apply skills learned appropriately.

Krause (1978) acknowledged that mathematics competence is not enough; some teachers have the knowledge for the subject content but were unable to transfer it to their students, and they cannot get to their students' level. Mathematics success depends not on the availability of texts but on the teacher ability and skills to utilise it. The best text and material if not put to good use will fail to produce successful learner of mathematics (May, 1974). Many teachers attach tightly to books which may be due to teachers' incompetency in mathematics (Thompson & Thompson, 1999). However, as indicated by Fleisch and Schoer (2014: 2) resources cannot produce achievement themselves rather it is the way in which the resources are put to use in the process of instructional practice and how it impacts learning. Nonetheless, the responsibility of mathematics teachers is to guide and interpret questions to help learners refine mathematics concepts and develop critical reasoning that will enable them to develop a variety of methods to address problems in mathematics (Kramer, 1978). They ought to analyse actual learning needs of their learners and provide necessary experience by which children can discover and absorb relationships of mathematical concepts (Goldstein & Rodwell, cited in Gordon, 1989: 4). The teachers that encourage active participation of learners in the teaching processes and use real life scenarios and physical manipulative substances in their instructional illustration promote knowledge acquisitions in mathematics. And those teachers that engage children using day to day mathematical experiences promote real learning in mathematics (Civil, 1998; Ladson-Billings, 1995 in Cross et al., 2009).

2.5.1.3 Socio-economic problems

Poverty hinders growth and development in any society. School achievement is to some extent determined by one's level of economic freedom. Smidt (2013: 12) points out that one major significant and neglected aspect in the discussion of child development is the issue of poverty. The way poverty is described and the impact it has on families and children's lives is worthy of proper attention. Perry and McConney (cited in Reys et al., 2012: 87) maintain that socio-economic status (SES) is the main determinant of learners' success in several nations. Landsberg et al. (2010: 30) indicate in South Africa poverty is reflected through deficits in language and communication, and educational backlogs. Landsberg and colleagues also acknowledge that children from poverty backgrounds are often faced with negative academic self-concepts; their motivation levels are low and they have an accumulation of school backlogs. Most of the children that develop in poor homes are in danger of poor school adjustment, high school repetition rate and high rate of school dropout (Lemmer & Van Wyk, 2010: 186). Bennett in Woolfolk (2010) reports that, about one-fourth of low-income earners' children are drop out from schools. According to Woolfolk (2010) chances of poor learners being held back in school is twice that of their non-poor peers. As long as these children remain in poverty the effect will be strong on their school achievement.

Cross et al. (2009) observe that children from low-income settings lag behind in mathematical skills compare to their middle-income peers. Cross et al. (2009) point out that the research of Jordan and colleagues shows that low income children start kindergarten lagging behind compared to their middle income peers on tasks that assessed counting skills. They lack knowledge of relationship between numbers; they are unable to recognise which number is the smallest and lack knowledge of number operations. According to Ormrod (2014) knowledge of letters and numbers are very important for school success; however children from lower-income setting have a gap in basic background knowledge of numbers and letters, and lack access to educational stimulation that will boost the development of such skills. Lemmer and Van Wyk (2010: 187) found that children from poor homes lack print culture, and educational resources and early literacy are minimal. Ormrod (2014) stated that schools in the low income communities are mostly poor quality schools, they are poorly funded and have a lack of equipment and maintenance.

Stannard and Huxford (cited in Lemmer & Van Wyk (2010: 188) report that the British National Literacy Strategy showed that the majority of the underperforming children are from poor homes that have a poor learning environment from early childhood. Ormrod (2014) stresses that most teachers teaching the low income children are not motivating and their expectation regarding learners academic achievement is very low, he states that teachers give less challenging tasks to

their learners, use non-challenging curriculum, less homework and inadequate learning opportunity is provided for development of advanced thinking skills. Woolfolk (2010: 131) warns that low expectation together with low quality educational experience can result in learned helplessness.

2.5.1.4 Attention deficit hyperactivity disorder

This term can be described as disruptive behaviour disorder which is characterised by over activity with difficulty in sustaining attention or impulsiveness (Woolfolk, 2010: 133). The condition is not typically one kind of problem; it involves attention disorder and impulsiveness together with hyperactivity. The problem may appear alone or in combination (Woolfolk, 2010: 133). Inattention is when students find it hard to concentrate and pay attention to a given task, they find it difficult to listen and follow instruction, and they constantly make mistakes (Ormrod, 2014). Hyperactivity and impulsiveness are evident when children cannot play quietly, interrupt others, can't take turns, talk excessively, give answer to a question without giving it a deep thought, have temper tantrums and implement instruction before reading directives or guidelines first (Friend & Bursuck cited in Woolfolk, 2010:).

ADHD learners are easily carried away by external and internal stimuli which most people ignore and don't take note of (Landsberg et al., 2011; Bley & Thornton, 2001: 18). But not only are these children physically active and inattentive they struggle to work toward a goal and cannot respond appropriately (Woolfolk, 2010: 133). Due to their inability to focus attention and their disruptiveness, they will find it difficult to participate and engage actively in tasks that require lengthy periods of time. They will also struggle to cope with discovery and inventory methods of learning because this demands active concentration on a task and the ability to sustain attention which will help to accomplish the task. Maintaining attention is crucial in mathematics learning. Schultz et al. (1989: 12) acknowledge that a child must be able to concentrate on important information and sustain this till the completion of a given task. Present mathematics learning involves active engagement which fosters learning, a child that gets easily distracted will find it difficult to master math concepts. Cross et al. (2009) noted that development of mathematical skill in children occurs in the context of cognitive and behaviour regulation and when stimulated and supported can foster learning of mathematics.

2.5.1.5 Poor reading and writing

A learner that struggles to read and write will find mathematics expression difficult, it will be hard to comprehend the meaning of the written words and solve problems expressed with words. According to

Lemmer and Van Wyk, (2010:184) learners who were unable to attain the grade norms in reading skill are likely to be in the group of attrition and failure. Engelbrecht et al. (2007: 90) recognized there are relationship between language and numeracy; they maintained that those learners who exhibit problems in mathematics have trouble with language, reading and writing. Reading literacy is essential particularly at the foundation and intermediate phase of learning. Most of the mathematics taught at this level is based on word expression. These word expressions make the subject fascinating and interesting. But a situation where learner finds it difficult to read and write will result to frustration in teaching-learning. Landsberg et al. (2011: 143) state that reading is assumed to be a major skill required for learning in this digital society. Vogel (2011: 215) points out that learner who struggle to read will battle to understand word sums and mathematics constructions. These learners will perform badly in written mathematics where they are require do the reading and determine the calculation.

Landsberg et al. (2011: 219) note that these learners mostly perform better in mathematics that involve mental arithmetic and their performance is woeful in word sums where they need to employ reading skills.

2.5.1.6 Difficulty with abstract and symbolic thinking

The learner that finds it difficult to think abstractly will battle to comprehend the connection between numbers and the objects they represent. It will be hard for them to understand the number structure and the connection between units of measurement (Vogel, 2011: 215). Abstract thought underlies the success of higher mathematics in school; a child that is tied to the concrete level will find it hard to solve abstract mathematical questions (Schultz et al., 1989; & Woolfolk, 2010). Schultz et al. (1989: 9) point out that the abstract stage is the highest efficient learning and problem solving phase in mathematics because there is no reliance on physically manipulating objects. As previously noted, abstract thought is the ability to think hypothetically, the ability to consider alternatives, to determine every possible combination and be able to analyze one's own thoughts (Woolfork, 2010: 38). And for a child to perform useful mathematics, he or she must be able to process abstract and symbolic information and concepts (Schultz et al., 1989: 8).

Bley and Thornton (2001: 15) maintain that children who struggle to reason abstractly will find it difficult to verbalize what they learnt and observed, cannot relate and represent what is occurring in symbolic form and find it difficult to comprehend what was displayed or explained to them. According to Woolfork (2010: 38) mathematics is mostly concerned with hypothetical conditions,

assumptions and givens. Abstract thought enables a child to have a grounded knowledge of mathematical concepts.

2.5.1.7 Difficulty with perceptual

Perceptual skill is essential for mathematical learning. Vogel (2011: 216) describes perceptual as the potency to give meaning to observed data by means of the senses. According to Woolfork (2010), perceptual is the process of discovering a stimulus and giving meaning to it, in other words the ability to interpret sensory information. Perceptual skills enable learners to interpret what they observe in their surroundings. Vogel (2011: 216) noted that learners observe when they move round in their environment or when they are doing delicate activities. The perceptual challenges that can cause barriers to successful learning include visual and auditory challenges. Visual problems include spatial orientation and direction difficulty, visual discrimination and constancy of shape difficulty, visual closure problem, problems with visual memory and problems with background and foreground discrimination. Auditory problems include trouble with auditory discrimination, auditory memory and auditory sequence (Vogel, 2011: 216-217).

Spatial orientation and direction helps learners to comprehend place value understand connections between objects and identify the distance that is between objects. It helps learners to identify the position a number occupies in a set. A child battling with spatial operation will find it hard to determine tens, units and so on. They will place numbers wrongly. For instance, in subtraction, when given $64-23$, a learner with spatial operation problem might subtract 6 from 2 because of place value difficulty; the learner cannot tell which number belongs to ten and the one for unit. Learners having difficulty with visual discrimination and form constancy will always confuse numbers like 3, 5 and 8, battle with mathematical symbols and they will confuse + and **. Learners battling with visual memory will find it hard to remember the procedure to solve mathematical problems and they constantly rely on examples (Landsberg et al., 2011: 220). Those having trouble with visual background and foreground usually lose their place when dealing with mathematical calculations that are long, they miss the order of the steps or procedures and cannot determine the calculating sign to use for solving problems (Vogel, 2011: 217).

According to Vogel (2011: 217) auditory perceptual difficulty does not have much effect because mathematics learning does not rely on this skill, but if a child is having problem with auditory discrimination they will struggle to determine the different numbers that sound alike, for example seventeen and seventy. Also, problem with auditory sequence will make a child count numbers incorrectly. Learners having these problems lack the auditory rhythmic potency to say numbers

correctly in the right order (Vogel, 2011: 217). Learners battling with auditory memory struggle to remember a common combination of addition and subtraction, usually they use their fingers to count and rely more on physical substance (Landsberg et al., 2011: 220).

2.5.1.8 Emotional problems

Emotional problems are reflected when learners display negative attitudes toward mathematics and lack confidence in their ability to solve mathematical problems. Learners that lack confidence normally convince themselves that they can't do mathematics and when they find themselves with a mathematical problem that looks a bit challenging they are easily demotivated (Landsberg et al., 2011: 219). Learners having negative behaviour toward mathematics use avoidance techniques to miss class such as pretend to be sick in order to avoid mathematics and they have anxiety while solving mathematical problems (Vogel, 2011: 215).

2.6 THE STRATEGIES WHICH ARE AVAILABLE FOR TEACHERS TO SUPPORT LEARNERS EXPERIENCING BARRIER IN MATHEMATICS

Learners experiencing barriers in mathematics require learning support/intervention; the inclusion policy declares in the White Paper 6 (Doe, 2001: 17) that the inclusive system is about giving support to all learners, educators and the whole system in order to meet the full capacity of learning needs with emphasis on development of good teaching strategies that will be beneficial to all learners. The policy also maintains that learners who experienced barriers to learning should participate fully as school community members and should be provided with quality education through effective teaching and given necessary support (Landsberg et al., 2011: 75). Engelbrecht et al. (2007: 94) believe that success can be realised in the classroom if teachers appropriately support their learners. Similarly Mahlo (2011: 28-29) believes that if learners are given support in accordance to their individual learning rate, ability and style of learning the huge number of attrition, failure and learners experiencing barriers will be reduced.

According to White Paper 6 (DoE, 2001) the method of addressing barriers to learning and exclusion is in line with the approach that focuses learning and teaching on learners. This approach is aware that development of learners' strengths and empower and allowing them to participate fully in the process of learning requires identification and overpowering of the sources of the difficulties in learning. The White Paper added that this approach is in line with new international approaches which centre on providing quality education to all learners; it is also consistent with the developmental and systemic approach which enables the understanding of problems and planning

of action. Mahlo (2011: 44-45) lists the following role expectations for teachers within the inclusive education approach:

- Teachers are obliged to identify and assess learners experiencing barriers to learning by using their schoolwork or some problem related to that area.
- Teachers must assist learners and deal with class challenges as they arise.
- Teachers should give extra attention, if the problem is not resolved, to finding the root of the problem. This will enable teachers to provide suitable support.
- If the problem continues teachers can call for extra help. The teacher must gather all relevant information to discuss with the ILST. The team will assist the teacher to deal with the situation.
- If the problem still continues and is not solved with teacher and ILST intervention, then they will call for regional or district assistance.

The Education White Paper 6 (DoE, 2001) recognises that a wide range of learning needs are present in the learner populace at any point in time, and learners may fail to learn successfully or be excluded from the learning system in a situation where these needs are not being met. Landsberg et al. (2011: 85) recognise that every learner has the ability to learn and teachers are obliged to make provision for every child. However various factors wrestle with teachers' capacity to reasonably support learners experiencing barriers in the classroom. As Hay, Smit and Paulsen (2001: 216) point out in their study, many teachers feel they are not ready and skilled to operate in an inclusive classroom setting. Wildeman and Lefko-Evrett (cited in Rembe (2012: 12) point out that the policy of inclusion usually requires appropriate infrastructure asset and enriched staff ability but usually lack the backing of adequate resources. Equipping teachers to manage diversity and assist individual learners as the need arises is nonnegotiable in order to achieve the inclusive demand. Da Costa (2003: 23) acknowledges that the critical aspect of implementing inclusive education is development of human resources. Preparation and professional development of teachers will assist them to provide appropriate support to their learners in an inclusive setting.

In terms of identifying barriers, SIAS stresses early identification (Landsberg et al. (2011: 64), which can be accomplished through assessment. Assessment can help determine the appropriate support suitable for a particular learner. However, Landsberg et al. (2011: 64) are of the view that SIAS's emphasis on assessment is a diagnostic approach and does not specify the type of support needed to meet the barriers in their classes, and may lead to mere labelling of the learner rather than supporting the learner. Assessment should be carried out frequently to evaluate the progress of any support given to learners and to monitor the effect of teaching strategies. Assessment is described

by the IDEA (2006) as a dynamic continuous process which guides and directs decisions regarding students with suspected or already identify disability (Smith, Polloway, Patton & Dowdy, 2015). According to Linn and Miller, assessment involves many approaches to sample and observe the skills, knowledge and strength of students (Woolfork, 2010: 495). For assessment to yield an effective result it should be carryout on a continual basis. Assessment should be done before, during and after support has been given to the learner.

2.6.1 Importance of assessment

Assessment is a crucial tool in evaluating academic achievement and to determine the area where a learner requires support. Learners experiencing learning barriers need to be assessed prior to provision of support in order to detect their lack and to determine their exact requirements. Assessment is used to monitor learners' progress; the NCTM assessment standard has called for several shifts in monitoring the progress of learners, which include assessing the assessment of their capacities rather than concentrating on testing their factual knowledge and skills (Reys et al., 2012: 7). Continuous assessment helps to gather reliable information, helps to detect their weak areas and trails the academic progress of the learner. It notes the level of attainment and what learner is still battling to achieve. The initial assessment enables a teacher to have concrete knowledge of a learner's condition and helps them formulate a learning objective that must be achieved. Continuous assessment helps to follow up the success of the set objective and to verify if the objectives are realistic and attainable.

Assessments help to detect any limitation in the support strategies and allow teachers to make necessary adjustments and modifications. Killen in Carl (2009: 97) identifies the following reasons for assessment: recognize the extent of the learning outcome; encourage learners to invest more in their learning; to identify learners that are prepared to advance; for detecting learning barriers, that is to identify the nature of learning barriers and where they occur. He continues that assessment aids in providing feedback and can identify areas that need to be re-taught and ways of improving teaching and learning (Killen cited in Carl, 2009: 97). Mercer, Mercer and Pullen (2011: 78) stated that the reason for assessment is for data gathering to determine the efficiency of an instruction in order to make a suitable adjustment to the instruction. According to them assessment is categorized into four main purposes namely, screening, diagnosing and monitoring of progress, and evaluating student outcomes.

Landsberg et al. (2011: 55) indicates that assessment helps to gain understanding of learner's learning behavior, for instance their learning style, their strategy of solving problems and so on. The

information derived from initial assessments should guide teachers to plan appropriate support for individual learners. Appropriate methods and techniques should be used to assess learners. Assessment should be in accordance with the regulation and policy of the curriculum stipulated by the Government.

2.6.2 Individual support plans

Inclusive education acknowledges that individuals differ likewise their learning needs differ. Landsberg et al. (2011: 84) indicate that learners who need support need some measure of individualised support. The DoE (2008: 15) specify the need to draw up individual support plans (ISPs) in order to keep track of support administered to learners and their progress. Teachers need to pay attention to particular needs of individual learner and not group or use the age-old approach of 'one size fits all' to address barriers to learning. Landsberg and Dednam (cited in Landsberg et al. 2011: 84) outlined five basic steps to execute ISPs as follows:

- The assessment to identify prior knowledge and what is already mastered.
- Set the programme outcome, that is, the expectation and what the learner should know at the end of the support.
- Choose the content for the learning plan.
- Select a strategy for support.
- Assess progress made by the learner.

2.6.3 Support available for teachers to improve their pedagogical practice and mathematical performance

Support is essential in the management of learning barriers; not only do learners require support, teachers as well need to be supported in order to handle the situations in their classes. According to UNESCO (2003) giving support to educators is an important aspect in developing a more inclusive centre for learning. Support is described by Mahlo (2011: 54) as all actions that accelerate the school capacity to attend to diversity. Teacher support is a necessity in the inclusive setting; the Education White Paper 6 (Doe, 2001: 17) pointed out that the inclusive system is about giving support to all learners, educators and the whole system in order to meet the full capacity of learning needs, with emphasis on development of good teaching strategies that will be beneficial to all learners. Landsberg et al. (2010: 85) avers that for teachers to achieve the demand of making provision for every learner to succeed, they need to be supported by both institutional level support teams and district based support teams. Engelbrecht et al. (2007: 95) states that it would be impracticable to

think teachers will cope with the challenges and changes by themselves alone. They need to be supported both inside and outside their classrooms. Similarly, Porter and Stone (cited in Mahlo (2011: 68) state that if teachers are to actualise effective inclusive schools they will need to be helped in achieving optimistic changes in attitude regarding new instructional approaches. Mahlo (2011: 5) observes that there is a deficiency in teacher and learner support in within the inclusive education approach and absence of support for teachers influences the effectiveness of implementing inclusive education.

The Department of Education acknowledges that the success of addressing learning barriers is dependent upon the teacher and education managers (DOE, 2001). For teacher empowerment to manage the barriers experience by learners in learning, the government in White Paper 6 (DOE, 2001) has initiated a plan through district support teams to provide teachers access to suitable pre- and in-service educational training and professional support services. White Paper 6 recognises the establishment of school based support teams to equip teachers in managing learning barriers in their classes (DOE, 2001). Du Plessis (2013: 57) argues that all stakeholders ought to be involved in the educational system, which must start from the DOE to provincial, district up to subject advisor level. The role of subject advisor according to Du Plessis ought to be clarified at nationally and the precise nature of school and classroom support they are to provide to teachers should be specified. However, Mahlo (2011) argues that institution-level support teams (ILST) are not given adequate support in the course of carrying out their tasks in relation to resource materials, guidance and emotional support.

2.6.3.1 Institutional level support team/school based support team

According to the DoE (2005) an institutional support team is an internal support system inside institutions such as early childhood centres, schools, colleges, adult learning centres and higher education institutions. The DoE (2011: 9) describes ILSTs as support systems at the school level that concentrate on identifying, assessing, and supporting areas that require support and development within the school context. As indicated by Engelbrecht, Oswald and Forlin (cited in Mahlo (2011: 198) establishment of ILSTs have to be part of support webs for teachers and learners in South Africa schools. These teams are responsible to liaise with the district based team and other relevant support providers in each institution regarding identifying and meeting the needs of their own institution. It is worth noting that the purpose of all of these activities is to identify and address barriers to learning in order to promote effective teaching and learning (DoE, 2005). Teachers need

support from all educational structures for them to manage diversity and address barriers in learning in their classes.

ILSTs provide support to educators that are experiencing challenges and those that are not confident to deal with learners experiencing barriers to learning (DoE, 2005). The DoE (2011: 10) recognises that teachers need to be supported as they implement assessment concession policy, programmes for addressing health issues, psycho-social and behavioural issues, and as they support learners with impairment and so on. Mahlo (2011: 74) asserts that the ILST is a swift, organised and effective manner whereby teachers are supported to identify matters in education that need to be addressed as they arise. The ILST creates an actual plan to solve these matters by executing tangible steps. However, research by Nel (2014) found out that the ILSTs are not always functional as they are supposed to be, because substantial workloads weigh teachers down and averts them from giving attention to individual learners.

2.6.3.2 District-Based support

According to Engelbrecht et al. (2007: 54) district support teams have the prime obligation of managing the process of developing the capacity of learning locations, to understand and address diversity and barriers to learning and development. Their responsibility according to the DoE (2005: 23-24) includes providing assistance to educational institutions in identifying and addressing barriers to learning and to stimulate effective teaching and learning which includes both classroom and organisational support, as well as provision of specialised learner and educator support as they are able to incorporate professional support services. They also provide supportive material as indicated (DoE, 2005: 24).

According to Padayachee, Naidu and Waspé (2014: 62) the GDoE inherited disjointed and dissected functions from the erstwhile education systems with quality and resource allocations being exceedingly uneven and differentiated. Nyanda (2014: 111) points out the post-1994 government sought to redress this unequal access to education through equity in resource allocation and using education as a focal point for socio-economic reforms. According to the DoE (2001: 32), “A key responsibility of the district support teams will be to provide curriculum, assessment and instructional support to public adult learning centres, schools and further education institutions in the form of illustrative learning programmes, learning support materials and assessment instruments”.

2.6.3.3 Parental support

Lemmer and Van Wyk (2010: 200) indicate that research has proven positive effects on learner achievement and on school effectiveness when parent involve themselves in their child's education, a point supported by Luxomo and Motala (2012: 135) who state that parental participation in their children's influences their access, attendance and retention in school. Parent/guidance support is imperative in a child's education – they have an obligation toward their children which includes their academic wellbeing. Vogel (2011: 27) indicates that parents are the best source to provide teachers with learners' information because they know their children's strengths and weaknesses, and they can cooperatively provide learning support. Likewise, Mpya (2007: 79) indicates the importance of parents' provision of relevant information regarding their children which can aid teachers in fostering support for learners experiencing barriers. Landsberg et al. (2011: 92) are of the opinion that parents are the best long term teachers for their children, and when they collaborate with education practitioners the effect on their childrens' development increases.

Lemmer and Van Wyk (2010: 200) indicate children's success is lifelong when both schools and families collaborate to give them learning support. Epstein (cited in Luxomo and Motala (2012: 135) adds that parental participation has the potential of enriching children's academic success because it give parents the confidence and enablement. Cooperative work between parents and teachers can result in real modification in learner's behaviour unlike when one party works alone (Landsberg et al., 2011: 501). Parents have a positive impact on teaching as commented on by Swap (cited in Lemmer & Van Wyk (2010: 200) who claims that educators derive benefits when parent are involved with their child's education, they have the feeling of been supported and valued and this refreshes their zeal for problem solving. The DoE (2006 cited by Luxomo & Motala, 2012: 149) indicates that collaboration between school and parents is crucial in instilling learning and teaching culture and this can erase children's perception that education is unexciting and immaterial. Likewise Apelman and King (1993) indicate that parental efforts to teach their children mathematical skills prepares them for formal mathematics learning and similarly parents effort to help children count and name various geometry shapes sets a good pace for them to become good mathematicians.

The South Africa School Act (84 of 1996) has sanctioned the participation of parents in their children education. Even Landsberg et al. (2011: 40) noted that educative programme to give supportive assistance to parents on child raising and parent participation in all developmental stages have commence on a national basis. This is imperative because learning is a continuous process and does not end at school. The White Paper 6 (DOE, 2001) recognises that learning is bigger than official schooling and accepts that it also occurs in the home and community, and can happen within formal

and informal settings and structures. Home is where children learn behaviours that are socially acceptable (Landsberg et al., 2011: 501).

Inclusion of parents in academic affairs is non-negotiable because they have good knowledge of their children's behaviour and the problems they are experiencing. Research by Luxomo and Motala (2012: 148) reveals low parental involvement in SBGs and that most parents place the sovereign responsibility of their children's success on the teachers and they are unwilling to do their part. To increase parental participation Mahlo (2011: 193) recommends the creation of awareness of learning barriers; she argues that if parents are aware of the problem and how it impacts their child's future they will take suitable responsibility. Similarly Mahlo (2011: 192) indicates that parents' participation in SIAS will enable them to comprehend why their child is referred to as having a barrier, and that the barrier disturbs their learning and consequently the child requires assistance.

2.7 CONCLUSION

Teaching is a complex professional career which attracts numerous challenges. Accommodating diverse learners and providing for their specific academic needs put teachers in awkward situation during the process of pedagogic activities. This literature review sheds light on the various challenges confronting the current paradigm shift in education which changes the teaching focus from the traditional method that most teachers are accustomed to toward a practice that is learner-centred which involves active participation of both teachers and learners. This shift is taxing for teachers especially for those in the outlying areas where limited or no support is available.

For teachers to adequately address barriers to learning they need to be equipped professionally. The initial and in-service development training of teachers' profession should develop teachers in the area of identifying the learning barriers, and recognition of and the ability to use the right support strategy to address the barriers. Teachers need to acquire knowledge on how to use a variety of assessment technique to diagnose and address the barriers obstructing mathematics learning.

For teachers to satisfactorily support learners experiencing barriers to learning mathematics adequate strategies ought to be available to them. Constant support is required from the SBST, the District based support team, and from the parents because addressing learning barriers is a collaborative effort with the involvement of the major role player coming together to cooperatively alleviate the challenges barriers to learning posed in the teaching-learning situation.

CHAPTER 3 : RESEARCH METHODOLOGY

3.1 INTRODUCTION

The foregoing chapter provided an in depth discussion of the literature related to challenges in teaching learners experiencing barriers in mathematics. This chapter examines the methodology and design which the researcher adopted for the study. The design and method help to answer the research questions stated at the beginning of the research work and to realise the study's main aim which sought to investigate the challenges experienced in teaching learners experiencing barriers in mathematics at the intermediate phase level in selected schools in Tshwane South district, Gauteng, South Africa. In this chapter, details of data collection and analysis process are discussed, the philosophical paradigm that guide the study and its relationship to study is explained and ethical issues are discussed. The chapter begins with the definition of research design and method.

Research design as described by McMillian and Schumacher (2010: 20) is the steps used in conducting a study or a general plan that describes how a researcher will set up the study, the method of data collection and what happens to the subjects. Lichtman (2013: 406) describe research methods as the particular ways or tools which researchers use in conducting a study which involves collection and analysis of data. Research methodology expresses the general framework for carrying out a study. The purpose of the design according to McMillian and Schumacher (2010: 20) is to make a specific plan for generating empirical evidence which will be used to address the research questions. Hence, for this study, the researcher adopted qualitative research method. The relevance and significance of this method are discussed in due course, but firstly the philosophical assumptions that guided this study need to be established as they enlighten the understanding of the research method employed.

3.2 PHILOSOPHICAL PARADIGMS

Philosophical paradigms are assumption or beliefs people hold regarding their stance in respect of reality and knowledge (Tracy, 2012; Maxwell, 2013). Bogdan and Biklen (1992: 33) describe paradigm as "a loose collection of logically held together assumptions, concepts, or propositions that orient thinking and research". Kuhn (cited in Maxwell (2013: 42) argues that philosophical paradigms are conformation of beliefs, values and techniques shared by members of a particular community. The philosophical assumptions human beings hold regarding reality are imperative for

understanding the total perspectives from which a study is designed and carried out (Krauss, 2005: 759). This study was designed and based on the philosophical assumption of constructivism.

3.2.1 Constructivism

Constructivists' stance is that reality is constructed from several dimension and subjected to changes and there is nothing such as observation or measurement of a unitary constant reality (Merriam, 1995: 54). It is recognised that human activities are not concrete substance reality that can be discovered or measured (Tracy, 2012). Meichenbaum (cited in Kinsella, 2006: 279) states that the constructivist view premised on the notion that human beings actively construct their own realities and craft prototypes of their own world. Piaget likewise acknowledged the construction of knowledge by an individual and he argues that through active involvement they initiate their learning (Turner & Hamner, 1994). The presupposition of constructivists is that a person seeks to understand the world in which they live and work and form subjective meanings of their experiences (Creswell, 2003: 8).

The central focus of this study is to investigate the challenges teachers' experience when teaching learners experiencing barriers in mathematics. The constructivist paradigm is ideal for this study because it assists the researcher and gives the opportunity of understanding another person's interpretation of reality (Merriam, 1995: 54). According to Tracy (2012: 40), interpretive is the same as constructivist as the constructivist paradigm enables the researcher to interpret and understand how participants construct meaning and the way they view what is transpiring in their environment. The constructivist believes that people's ontology differs likewise the meaning they attribute to it will be seen differently. So using this paradigm enabled the researcher to obtain various versions of interpretations from teachers of challenges they encountered in their pedagogy practices, in relation to addressing barriers learners experienced in mathematics.

Tracy (2012: 41) states that constructivism places emphases on values and context. According to Crotty (cited in Creswell (2003: 9) qualitative researchers strive to understand participants' context by collecting information in person in the context and interpreting the findings. Krauss (2005: 759-760) states that the ideal manner to comprehend what is transpiring is to be submerged in and go along with the context being investigated, to have a feeling of being part of the setting. The paradigm permitted immersion of the researcher in the setting or context (school) and the researcher was able to relate with intermediate phase mathematics teachers to explore their various styles of addressing learning barriers in their classes and to gather how they attribute meaning to their experiences as they teach mathematics. Constructivism observes that knowledge construction

occurs when people actively interact in their social context (McMillian & Schumacher, 2010). The interaction that was established in the research setting fosters close teamwork that exist between the researcher and participants. According to Crabtree and Miller (cited in Baxter & Jack (2008: 545) this intimate relationship enables researchers to get participants to disclose their stories. Individual perspectives regarding their situation are distinct because the way people understand their world is their construction of it and is not just based on objective perception of reality (Maxwell, 2013: 43).

The quest to understand one's experience or action is part of people's daily routine but the meanings people ascribe to these experiences are diverse and multiple (Creswell, 2003: 8). In relation to multiple reality and different meaning ascribed to it, Noddings (cited in Kinsella (2006 : 278-279) indicates that constructivists share three generic agreements which form their base: they share the view that people construct knowledge during the process of reflection, in the process of these constructions people activate their cognition structures and, finally, cognition structures develop continuously. Piaget (1970) claimed that cognitive structure develops; it's not an innate or inborn feature. This development occurs through the means of assimilation and accommodation. As a child interacts and mingles with their environment they assimilate new information together with the existing one in their schemes (mental structure). Accommodation of the new information results in change of the structure which thus means cognitive development has occurred (Vogel, 2011: 45). Krauss (2005: 760) states that there is a screening, translation, and alteration of information impinged in our cognitive structure or complete discard of the information which presently exists in that structure. In addition Krauss (2005: 760) stresses that people enforce order on their perception about the world in their quest to attribute meaning; however, Krauss concluded that meanings are not in external feature but can be derived from cognition. Guba and Lincoln (1994: 110) shared the same view of the mind by saying that constructivists conceive realities as a form of multiple nonconcrete cognitive constructions. Conclusively the adherents of constructivism have the ideology that a person's mind is a result of constructive symbolic activity and the result is reality which is derived particularly from meanings a person creates (Meichenbaum cited in Kinsella, 2006: 279).

3.3 QUALITATIVE RESEARCH

What a person intends to study will determine the tool and technique applicable and fit for the study. According to Guba (1981: 76) just as it is appropriate to choose analytic statistics that accurately suit a set of data equally it is appropriate to choose the paradigm whose presumption fits the phenomenon that will be investigated. Since the study aimed at investigating the challenges teachers experienced in teaching learners facing barriers in mathematics, the appropriate method to

study this idea is the qualitative approach. Macmillan and Schumacher (2010: 320) describe qualitative research as an approach used in studying how people ascribed meaning to their experiences in their natural context. Krauss (2005: 762) believes that by nature people have the tendency to understand and give meaning to their live experiences, a feature that makes them unique. Frankl (cited in Krauss (2005: 762) claims that meaning is of utmost significance in human life.

The experience of an individual in relation to life differs from one to the other. Equally, the definition they will give to such will be different. The qualitative approach is suitable for this study because the adherent of qualitative research recognises that people's experiences differ as does their reality (Krauss, 2002: 760). Creswell and Miller (2000: 125) state that the qualitative paradigm is based on the notion that reality is constructed socially and is exactly the way participants see it. The qualitative approach employed in this investigation helps to facilitate understanding of intermediate phase teachers' perception regarding the challenges they experienced in teaching learners experiencing barriers in mathematics. This approach enabled researcher to understand the participants' contextual view and perceptions of their reality relating to work experiences,

Additionally, the qualitative approach enabled immersion of the researcher in the situations or circumstances which are present in the context of the study and only then are statements able to be drawn (Tracy, 2012). According to Crotty (cited in Creswell (2003: 9) qualitative approach researchers strive to understand participants' context by going to collect information in person in the context and interpreting the findings. The interviews which were conducted in the natural setting of the participant which facilitated rapport and enabled the researcher to gain in-depth understanding of how teachers attribute meaning to their work experiences and the challenges that emanate from it. Crotty (cited in Creswell (2003: 9) stated that "The basic generation of meaning is always social, arising in and out of interaction with a human community".

Qualitative research follows a reflexive process (Hammersley & Atkinson cited in Maxwell, 2013). and has the distinctive goal of fostering the process of meaning making. This helps to see how general forces influence particular circumstances (Hopper cited in Lichtman, 2013).

Maxwell (2013: 79) stresses that framing qualitative questions in terms of the particular setting or participant that is being studied helps to prevent inappropriate generalisations and assuming that other people have similarities to those studied. This facilitates recognition of diversity, thus preventing conclusions that ignore differences among those studied, and helps the researcher to concentrate on the particular belief, actions and events they are studying and the contexts where

these are situated. This study was specifically carried out in five township schools in Mamelodi with the aim of investigating the challenges experienced in pedagogical practices of mathematics in that particular setting in order to gain knowledge and to understand how learning barriers impede learners performance in mathematics .

3.4 RESEARCH DESIGN

The case study design is specifically employed for this research work because this is the best design which helps in answering the research questions (Merriam, 1998: 41). A case study is described by Creswell (2008) as in-depth study of a bounded system. Merriam (1998: 28) specified that if there is no intrinsic boundary in the phenomena you are studying it is not a case study, because a case study requires a boundary to be considered a case – it could be bounded by time and place and activity and also by definition and context (Creswell, 2003; Miles & Huberman, 1994; and Stake, 1981).

The challenges in teaching learners experiencing barriers in mathematics in intermediate phase in Tshwane, South Africa, has a borderline and it is bounded by place and activity, the place is the research setting and the activities are teacher's actions in pedagogical practice.

Ellet (cited in Tracy (2012: 264-265) maintained that the first aspect of a case study entails a descriptive narrative which explains problems and possible solutions. A qualitative case study accelerates investigation of phenomena in a setting by using a range of data sources ensuring issues are not viewed through one lens but through multiple lenses to enable multiple aspects of the phenomena to be understood and discovered (Baxter & Jack, 2008: 544). This study involved ten participants/informants. The information gathered from the ten sources enabled the researcher to cross-validate to give credence to the research findings. A case study allows the researcher to choose the case and state questions in terms of the specific case that is selected (Maxwell, 2013: 78), in order to collect information that offers in-depth understanding (McMillian & Schumacher, 2010: 345-346).

A case study is complemented by conceptual analysis which gives recognition to scholarly concepts which enables readers to comprehend the case in a more complex sense (Tracy, 2012: 265), and justifies the specific case selected in terms of the existing theory and research, and likewise the goals of the study (Maxwell, 2013: 78). This study was informed by Piaget constructivist theory. The theory's relevance was based on its impacts on learning and teaching method as was mentioned previously. This theory will enable both researcher and readers of the enquiry to have a sound understanding of the relation that exists between teaching and learning and how these influence the

outcome of the relationship. According to Merriam (1998: 41) a case study is firmly tied to actual life context which assists in giving complete rich accounts of the phenomenon.

The study specifically used collective, multisite or multiple case study which is describe by McMillian and Schumacher (2010: 345) as a combination of different numbers of cases in a study, and an instance where more than one setting or example is used. Baxter and Jack (2008: 550) indicate that when a study has more than one case it is referred to as a multiple case study or collective case and according to them, multiple cases enable researchers to perform analyses inside every solitary case/context and across the context. This study identified five schools where data collection was carried out. The data were analysed solitary and across context which helped to solidify validity. Baxter and Jack (2008: 554) point out that multiple sources of data held together in case study strength the study findings because many filaments of data are combined to widen understanding of the case. The multiple sources of data in this regard are the ten participants. Merriam (1998: 40) concurs that inclusion of multiple cases enhances the external validity of one's finding. Merriam (1998: 40) continues by saying that the more cases included in a study and the more variation one has across cases, more likely that the interpretations given to cases will be convincing.

3.5 DESCRIPTION OF THE STUDY SITE OR SETTING

The Constitution of South Africa (RSA 1996b: 21) provides the legal framework for the unified system of education which is based on cooperative governance at three levels (Lemmer & Van Wyk, 2010: 127). The three levels are categorised as General Education and Training (GET), Further Education and Training (FET), and Higher Education (HE) (Lemmer & Van Wyk, 2010: 127). This study focuses on the General Education and Training Band at the Gauteng Department of Education. Burger (2006: 209) points out that the national department of education in accordance with the South Africa constitution has giving authority to the provincial legislature and government to run the affairs of education which is subject to the national policy framework.

The provincial department is in charge of general administration and management of education institutions (apart from higher educational institutions) in line with policy determined by members of the executive council (MEC) for education. Educational provisions take place from Head offices, Area, District, and Circuit offices (Lemmer, 2005; Lemmer & Van Wyk, 2010: 128). The Gauteng Department of Education has 15 districts under it administration with several area and circuit offices.

A site or settings is a place where events or activities happen (Neuman, 2000: 352). This study was conducted in Tshwane South Education District of Gauteng Province, in circuit 5, Mamelodi East. Five

schools were selected for the study from Mamelodi east circuit. This area is ideal for the research study because the schools in that area were implementing the GPLMS strategy.

The selected schools were primary schools positioned in Mamelodi east of Tshwane South District. Mamelodi is a township set up by the apartheid government with a majority population of black Africans. The languages widely spoken include northern Sotho, Sepedi, Tonga, Zulu and southern Ndebele. Apart from South African citizens residing in the area, many foreign nationals have moved in there including from Zimbabwe, Mozambique and other countries whose home language differs from languages spoken in South Africa. This township is characterised by high levels of poverty, HIV/AIDS, unemployment, lack of decent and adequate infrastructure, low levels of literacy among community members and crime.

There're a lot of informal settlements in Mamelodi. However, the township strives to improve standards of living by investing in various community outreach programmes such as Viva Foundation that caters for orphans and vulnerable children, and Itsoseng Clinic which offers psychological help to people, to mention a few. Different Africa language were medium at the foundation phase in the five schools selected for the study which include Sotho, Sepedi, Venda, Tonga and Zulu and this language were replaced at the intermediate phase. The schools were chosen because they were prioritised by the Gauteng Department of Education for the GMPLS strategy because they were nonperforming schools in terms of mathematics and language. The method employed to select the sample for this research is explained below.

3.6 SAMPLING

Sampling is the decision on where study will be conducted and who will be included in the study (Maxwell, 2013: 96). It involves the selection process of participants from a population, which entails decisions on the people, setting, events, behaviours and social process that will be observed (Durrheim, 2006: 49). For this study convenience sampling was used. Battaglia (2008) describes convenience sampling as a nonprobability method of sampling because those individuals are convenient sources of data for the researcher. Tracy (2012: 135) refers to convenience sampling as being opportunistic sampling, a sample plan that is convenient, easy and not expensive to access. Thus, this method is appropriate and is chosen because it is less costly (Patton cited in Maxwell, 2013: 97) provides easy access to participants, and is not time consuming (McMillian & Schumacher, 2010; Battaglia, 2008).

However, this technique has certain disadvantages, the major one being the inability to generalise findings of the results because sample selection size might not represent the entire population being

studied (McMillan & Schumacher, 2010: 140; Durrheim, 2006: 50). However, this study is not concerned with generalizing findings but with investigation and interpretation of challenges teachers experience when addressing learning barriers in mathematics

The total sample size for this study was ten educators. This number is adequately for the study because the logic and power in qualitative sample selection is that cases that are few are studied to in-depth and yield more insight regarding the topic (McMillan & Schumacher, 2010) and the insight derived from inquiry rests on the richness of the information of the cases and the researchers analytical ability rather than the sample size (McMillan & Schumacher, 2010).

Before contacting the participants for the study, the researcher obtained permission from the relevant officials at the Gauteng Department of Education. The letters written to obtain permission are added as appendix to this dissertation. The letters contain the title of the study and the purpose and importance of the study. Likewise the participants were notified and invited to participate in the study through the means of a letter. The study aim and purpose was clearly discussed with them and their role was explained. The researcher requested written consent from the participants to demonstrate their willingness and voluntary involvement in the study.

The participants involved in the study are educators of primary schools teaching mathematics at the intermediate phase. There were set criteria that were taking into account for sample selection. Maxwell (2013: 99) stresses that selecting the sample for study requires the consideration of knowledge of the setting where the study will be conducted. He also added that the following aspects need to be considered: the feasibility of access, the means for collection of data, the researcher's relationship with those participating in the study, and concern regarding validity and ethical issues (Maxwell, 2013: 99). The inclusion criteria were as follows:

- Participants will be employed in an institution of formal learning.
- Participants will be teaching mathematics at the intermediate phase of primary school.
- Participants will be selected from the previously quintile 1-3 schools, now referred to as non-fee paying schools.
- They will be selected from the prioritised schools implementing the GPLMS strategy and which have participated in the Annual National Assessment (ANA).
- Position in the work place or gender will not be used as criteria for selection.
- Number of years of working experience and age of the participants will not be considered.

3.7 RESEARCH INSTRUMENT

The data collection technique used in this study was interview. Maree (2010: 87) describes interview as a reciprocal dialogue that involves gathering of data from participants by the interviewer in order to understand their assumptions and behaviours. Interviews are conducted in different ways and there are different types of interview namely; structured, semi-structured and unstructured. For the purpose of this particular study semi-structured interview was employed. Semi-structured interview which is also referred to interview guide approach enable selection of topic and questions in advance (see appendix F for interview schedule). This allows the researcher to decide on word sequence of questions and layout during the interview. Semi-structured interviews are flexible and the researcher does not have to adhere to the interview guide, this allows participants to bring in issues that are not anticipated (McMillian & Schumacher, 2010: 356). It enables the researcher to ask questions that are relevant and important to the inquiry which are not initially listed in the interview guide (see appendix G). Semi-structured interviews permit investigation and elucidation of answers (Maree 2010: 87), this allow the researcher to dig deep for clarity on issues at hand. Semi-structure interview questions are open-ended format this enable participants to respond to questions in a less restrictive manner (McMillian & Schumacher, 2010: 206). According to Yin (2012: 12), open ended interviews are flexible, offering rich and extensive material. The flexibility structure of the interview enable lengthy conversation between participants and the researcher, consequently the researcher was able to explore how participants construct their realities which provide crucial insight into the case.

Face to face strategy was used for the interview process which stimulated interaction. Face to face interview creates an opportunity for rapport and enable gathering of verbal and non-verbal data (Tracy, 2012: 160). The interviews did not exceed one hour and were carried out during participants' non-contracted hours in order not to disrupt class activities. The interviews were tape-recorded with the permission of the participants. Recording of interviews guarantee that the verbal interaction is complete and offers a reliability check (McMillian and Schumacher, 2010: 360). Similarly Simons (2009: 52) added that tape recording enables the researcher to concentrate on the interacting nature of the interview and they do not have to write everything down during the interview.

3.8 DATA COLLECTION PROCESS

Data collection began by obtaining permission from the relevant officials at the Gauteng Department of Education and Tshwane South District; followed by getting permission from the principals of the schools where data was collected. Similarly educators were informed about the study and they were

invited to participate in the study. The instrument that was used for data collection was face to face semi-structured interviews. Sample selections were by means of convenience sampling. The participants were intermediate phase educators. The study was conducted in Mamelodi East of Tshwane south education district. This site was selected because the research focused on prioritised schools implementing the GPLMS strategy which had participated in the annual national assessment (ANA). After obtaining permission from the relevant body and the participants, the details of the research was explained to the participants including the purpose and the importance of the study to their profession. The participants were requested to sign a consent form. The data collections begin with details explanation of what the research entails to the participants. Participants were told that their participation is voluntary and they have the right to withdrawn at any time (see Appendix D). Face to face interviews were carried out among 10 participants after working hours. This was done during non-contracted hour to ensure that the research project did not interfere with the school activities. The researcher engaged in an extensive interview with each of the participants which took approximately 45- 60 minutes. The interview sessions were flexible and questions were not adhered strictly to the interview schedule/guide questions (see appendix F for interview guide/schedule). The flexibility of the interview allows questions to surface as the circumstances demand, which also permit the participants to contribute extensively in less restrictive manner. During the interviews notes were taking and the interviews were taped-recorded with the permission of the participants. Note taking and recording of interviews help the researcher to capture accurate information that transpires during the interview sessions.

DATA ANALYSIS

Analysis of data is a methodical procedure used for arranging all data accumulated to develop an understanding of the data and helps the researcher to present the findings to others (Bogdan & Biklen, 1992: 153). Inductive analysis was used to analyse the data. The inductive process enables the researcher to moderate and synthesise data obtained to derive meanings by starting from specific data and arriving at categories and patterns as per McMillian (2010: 367), as the aim of this study is to investigate challenges teachers experience when teaching learners experiencing barriers in mathematics at the intermediate. The task of analysis is to interpret data collected and to derive sense out of it (Bogdan & Biklen, 1992: 153). Similarly Krauss (2005: 765) indicates that the ability of qualitative data analysis to create meaning makes it a distinctive and potent epistemological tool to understand even experiences that seem mundane.

Analysis of data in the qualitative approach is an on-going practice which must be performed skilfully; however this requires intellectual competence and knowledge of research method

(McMillian & Schumacher, 2010: 367). The researcher ensures that data analysis began immediately after each interview session, thus this help to ease the burden of voluminous data collected. In the qualitative field there is no standard procedure for analysing data (McMillian & Schumacher, 2014). For this study the following steps were used to analyse the data.

The study followed the prototype of inductive analysis steps proposed by McMillian and Schumacher (2010: 369) which are: data presentation which involves collection of data, data organisation, and transcription of data into segment; coding of data, describing data, forming categories and developing patterns. A matrix table was used to display the data. Matrix tables organise vast chunks of data into a format that is easy to reflect on, verify, and draw inferences and other forms of analysis (Miles & Huberman, 1994). Below is a detailed description of the data analysis process followed in this study.

- Firstly the researcher organised the data in order to separate it into few meaningful workable units. This was done by using topics that were fixed in the questions; each category of topic was further divided into subcategories as data analysis proceeded.
- The Researcher then started to transcribe all the data collected during interview sessions. Transcription is the process of typing all information collected and converting them to a format that will enhance analysis. The researcher meticulously read all the data. Large units of data were broken down into smaller meaningful units in the form of segments. Segments are words, phrases, sentences or paragraphs that contain ideas, episodes or relevant information.
- The researcher read the data several times to get a sense of the whole in order to begin coding. Coding is the name; phrase or symbolic meaning assigned to data segments. Code can be activities, events, strategies, respondent perspectives or context.
- After coding the entire data segment the researcher sought to find categories from the codes that were generated. Categories are group of codes. These symbolises main ideas that are used in describing related coded data that as a single category provides meaning to a combination of codes.
- Finally patterns/themes were derived. After codes had been categorised, themes were discovered from the categories. In this study patterns were referred to as themes.

3.9 TRUSTWORTHINESS

According to Mahlo (2011: 97) trustworthiness is a method of guaranteeing thoroughness in qualitative research by not compromising relevancy. Shenton (2004: 63) identified that positivists frequently question the trustworthiness of qualitative research. Similarly, Maxwell (1992: 279) states

that the adherents of quantitative and experimentalist research always critique qualitative research for lack of a standardised approach to ensuring validity. However, Shenton (2004: 63) states that the structures for ensuring strictness in qualitative practice have been in effect for many years. The following criteria were followed to establish the trustworthiness of the study.

3.9.1 Credibility

Bowen (2005: 215) describes credibility as the assurance of the truth in the findings of a study. Merriam in Shenton (2004: 64) says that credibility deals with such questions as how consistent are the study findings with reality? Guba (1981: 80) argues that to establish truth value, the naturalists are more worried with testing the credibility of their findings and elucidations against numerous sources or participants from which data were taken. In this study, to ensure credibility of the study findings the researcher obtained extensive data from ten participants in five different settings; data from varied informants helped to solidify the study credence a process known as triangulation through wide-ranging informants as advised by (Shenton, 2004: 66). Shenton (2004: 66) further emphasised that individual opinions and experiences can be verify contrary to each other's thereby resulting to constructing of rich images of participants' actions based on the contribution made by wide range of participants.

3.9.2 Transferability

Guba and Lincoln (1994: 316) describe transferability as the magnitude to which findings of a study can be applied to other settings and contexts. According to Guba (1981: 86) transferability can be ensured through thick descriptions of data. Denzin (cited in Creswell & Miller (2000: 128) referred to thick descriptions as in-depth and comprehensive information of experiences and actions of a particular phenomenon. This study offered detailed descriptions of the settings and full accounts of participants' experiences so that others who wish to use it in other settings or contexts may find a degree of fit or similarity to apply it (Guba, 1981: 86).

3.9.3 Dependability

Dependability is the degree to which findings can be repeated if there are similar participants and if the same research instruments are used under similar conditions (Creswell in Mahlo 2011: 98). Shenton (2004: 71) recommends that to address dependability the study process should be reported in detail as this will enable forthcoming researchers to repeat the work and the in-depth detail also permits the reader to assess the degree to which appropriate research practices have been followed

In light of this, full description of the research process followed in this study is discussed, detailed field notes were taken so to record all activities that happened and this was fully explained in the study to enable readers to gain a comprehensive understanding of the context of the study.

3.9.4 Confirmability

Guba and Lincoln (1994: 318) state that confirmability is the degree to which study findings are free from bias. According to Shenton (2004: 72) confirmability is related to the need for objectivity. Triangulation can be employed to moderate the consequences of the researcher's partiality. To ensure confirmability of the study the researcher interviewed ten participants to cross validate and all aspects of communication were taken in account such as body language, nonverbal communication and emotions in order to minimise any suppositions and bias towards the findings.

3.10 ETHICAL CONSIDERATIONS

McMillian and Schumacher (2010: 338) indicated that a reliable research design involves complying with ethical issues. The crucial ethical issues according to Leedy and Ormrod, (2013: 104) are protection from harm, voluntary and informed participants, right to privacy and honesty with professional colleagues. In addition Creswell (cited in Machaba (2013: 105) stated that obtaining consent letters, gaining approval to be interviewed, and obtaining agreement to terminate audiotapes should be part of ethical conduct. Therefore this study observed the following steps to ensure ethical issues were considered:

Permission access. The process of obtaining permission began by requesting permission from the Research Ethics committee of the College of Education of the University of South Africa (UNISA). Permission was also obtained to conduct a study within primary schools in Tshwane South District from the GDE (see Appendix A). A letter of permission was obtained from the principals of the schools where data was collected (see appendix C).

Right to privacy. McMillian and Schumacher (2010: 338) state that dishonesty violates informed consent and confidentiality. The right to privacy is an important consideration in a research project. In this study the participants were numbered alphabetically to maintain their anonymity and all the information obtained was kept confidential in a safe place where no one could access it except the researcher.

Voluntary and informed participants. In this study educators were informed about the study and were invited to participate in the study and their role was clearly explained (see Appendix D). The

participants were informed and given assurance regarding anonymity, and that all information gathered would remain confidential, and that their participation was voluntary and had the right to withdraw at any stage. They were informed that the interview would be audio-taped and they were assured that feedback would be given to them upon completion of the research (see appendix D). Afterward the participants were requested to sign a written consent form to confirm their agreement to participate in the project.

Honesty with professional colleagues. Research findings must be fully reported in an honest manner to avoid misrepresentation or misleading others regarding the nature of the findings (Leedy & Ormrod, 2013: 108). This study tried to avoid misleading and misrepresentation by ensuring that the participants went through the data after transcription to ensure that the researcher accurately captured the correct statements of the participants, and the participants' exact words and actions where quoted in the report of the findings.

3.11 CONCLUSION

In this chapter the research design and methodology were described and its relevance to the study was discussed. The research paradigm and ethical issues were also discussed. The interview instrument employed to obtain data was fully described. The intention is that the results obtained from the data will provide a clear understanding of the challenges experienced by teachers teaching learners facing barriers in mathematics, in the intermediate phase of the learning band. The data may be used to identify areas where teachers need to be supported in order to improve their pedagogical practice.

CHAPTER 4 : PRESENTATION OF DATA ANALYSIS

4.1 INTRODUCTION

The previous chapter presented the methodology used for the study. This chapter deals with presentation and interpretation of the data obtained. The prototype which was explained in Chapter 3 was used to analyse the data. This chapter provides a comprehensive report and interpretation of the data collected during in-depth interview sessions with participants to enable the researcher to answer the research question posed at the beginning of the study which sought to investigate the challenges in teaching learners experiencing barriers in mathematics, and to accomplish the research objectives. The discussion of study findings is presented under the categories and themes derived from the interviews with the participants. This chapter start with the presentation of teachers profiles which was obtained during the first few minutes of the interview sessions. The participants were asked to provide their background details to the researcher which include their professional qualification, experience in the teaching professional, indicate the grades they are teaching and number of learners in their class, including their gender and age. And the second section deals with presentation of the study findings.

4.2 PROFILES OF PARTICIPANTS

The profiles of the ten participants were derived from the interview sessions when they were asked to provide information about themselves to the researcher. For the purpose of confidentiality participants were numbered alphabetically, using letters TA to TJ to represent the teachers, with the letter T meaning teacher. Ten teachers from the intermediate phase were involved in the study. As it was indicated in Chapter 3, the teachers that took part in the study were selected given the reason that they teach mathematics at the intermediate phase and their schools were prioritised for GPLMS strategy.

In the first few minutes of the interview session the participants were asked to provide their biography details. The information of the ten participants provided during the interviews is presented in Table 4.1 and Table 4.2. Table 4.1 presents analysis of the qualification possessed by the participants. The rationale behind the collection of their qualifications was to meet the research aim which was to determine whether the teachers are well equipped to teach mathematics at the intermediate phase. Table 4.2 provides the contextual information regarding the experiential background of participants in their professional field, and indicates the grades they are teaching and

number of learners in each class, also the participants gender and age range were provided. The significance of this information is to provide readers with the generic context and experience of the participants that were involved in the study.

Table 4.1: participants' qualifications

PARTICIPANT	Qualifications
TA	Diploma
TB	Diploma ACE(Maths)
TC	SPTD ACE
TD	JPTD
TE	Senior certificate, senior primary diploma, BA Education
TF	Certificate B/Tech/ED
TG	Diploma, ACE
TH	B.ED.
TI	Certificate in outcome-Based education And Secondary teacher diploma
TJ	Diploma BA degree

Table 4.1 lists qualifications obtained by teachers who took part in the study. The qualifications of all the participants indicated that they all possessed the necessary academic requirements expected of intermediate phase teachers except for participant TI that obtained secondary teacher diploma which was supposed to be teaching at high school. Nonetheless, with all the participants specialising in teacher education, Table 4.1 reflect the proper qualifications expected of an educator.

Most of the participants possess impressive qualifications having obtained more than one qualification. Participants TB, TC and TG possessed diplomas plus advanced diplomas in education, with these one can assume they will be able to handle any challenges at the intermediate phase. Participant TA qualified with a university diploma while participant TD obtained junior primary teacher diploma and both were currently doing a correspond course to upgrade their qualifications.

Participants TE, TF, TH, and TJ all obtained bachelor degrees with TF having B.Tech in education and TJ Bachelor of Arts this however leave room for queries whether this qualification equate B.Ed

degree possessed by TE and TH in teaching of mathematics at the intermediate phase but TF having an initial teacher certificate and TJ a diploma in education places them in a good position to teach at the primary level. The overall qualifications presented are remarkable and there is no cause to query teachers' lack of qualification as a potential cause for challenges they experienced in their pedagogical practice.

Table 4.2: participants' profiles

PARTICIPANT	TEACHING EXPERINCE RANGE	NO. OF LEARNERS IN CLASS	AGE RANGE OF PARTICIPANT	GENDER	GRADE
TA	0-5	6-30 7-32	25-30	MALE	6 & 7
TB	10-15	4-36 5-36	45-45	FEMALE	4 & 5
TC	10-15	5-64 6-50	45-50	MALE	5 AND 6
TD	0-5	58	40-45	FEMALE	4
TE	20-25	33	45-50	FEMALE	6
TF	30-35	35	55-60	FEMALE	5
TG	10-15	44	40-45	FEMALE	4
TH	0-5	43	40-45	MALE	6
TI	30-35	GRADE 6-54 GRADE 7-45	55-60	MALE	6 & 7
TJ	20-25	GRADE 4-57 GRADE 5-52	45-50	FEMALE	4 & 5

Participant TA was a male teaching 30 and 32 learners in grade 6 and 7 respectively; he had 3 years working experience in teaching at the time of the study. He was worried about learners experiencing barriers in mathematics as the practice in his school might worsen those learners situation. He indicated that learners that perform below expectation were required to rewrite some papers which he sees as cheating and not helpful to those leaners involved. When asked why his school engaged in such practice, he responded by saying *"I think they don't want to record lower marks, I didn't see the need because to me it's a cheating, I don't like the idea"*. In order to avoid such practice he indicated he gave his learners mini tests where he assessed topic by topic to solidly prepare them for formal assessment. He made mention of lack of resource materials as most of his learner relied on concrete manipulative substances to learn better. The mode of intervention/support he gave to leaners experiencing barriers is to first identify the barriers at the start of first term, and then he indicated that those learners were assigned two books, one for regular classwork and the other for their intervention classes where they have to do their extra work. These books are regularly checked by

district officials to ascertain that they are actually giving support to learners. However, he indicated that apart from district official monitoring the books he felt he was not getting adequate support from them. TA acknowledged that GPLMS is teacher friendly as the strategy eases the work load of teacher with readymade lesson plans available for teachers and also noted that it helped to improve their teaching with varieties of teaching examples contained in it. However, he indicated that GPLMS is running at a fast pace although its contents are relevant to learner age. According to him the strategy was designed to address learning barriers in mathematics but the time given to learners to accomplish the task is not accommodative. To facilitate learner's interest and performance in mathematics he pasted their results at the class entrance. According to him this practice urged his learners to perform better as no one wants a poor result to be pasted on the wall for all to see.

Participant TB was a female teacher, teaching grade 4 and 5 with 36 learners in each. She has 14 years' experience in teaching. She revealed that quite a number of learners are struggling in mathematics which she believes is as a result of problems they accumulated from the foundation phase. She said that the large number of learners experiencing barriers in the class prevented her from giving individual support to learners. She indicated that transition of learners from the foundation phase to intermediate comes with a challenge to teachers, as these learners are taught with their mother tongue at their previous phase. She complained of insufficient resources as the grade she's teaching relies more on aids to learn better. She acknowledged that district official come to check and they investigate what their needs are, but never supply them with the necessary materials. She requested that more support be provided from the side of the district. She suggested the introduction of English as medium at the foundation phase. She further noted that GPLMS is a bit fast and the contents re a bit high for the grade 4 learners.

Participant TC was male teaching classes of 64 and 50 learners in grade 5 and 6 respectively. He has been in the teaching profession for the past 15 years. He complained about overcrowded classes which prevent him from giving due assistance to learners experiencing barriers in mathematics. He admitted that GPLMS makes teachers and learners work easier. According to him the strategy improved teacher's skills however he criticised the fast pace at which the strategy is running which did not accommodate learners experiencing barriers because teacher had to rush to keep up with time stipulated in the plan. He pointed out that most of the learners were struggling to complete the tasks due to the short time allocated. When asked about the training he had received he acknowledged he had received adequate training which included TUT maths training, RCS (revised curriculum statement) RNCS and then CAPS training which he appreciated. He also valued the support received from the GPLMS coaches when they visit their school, saying that the coaches

rendered assistance to them in their classes. He supports learners experiencing barriers by organising extra classes for them; he also switches language codes for the learners to understand better.

Participant TD was a female teacher with 5 years of experience in her teaching career. She teaches grade 4, a class containing 58 learners. Her major challenge is an overcrowded class as she complains of her inability to move freely to render personal assistance to individual learners. She laments that the majority of the learners cannot read and write, and they struggle to complete their tasks. She acknowledged having received adequate training and that she is being supported by both the SBST and DBST. When she was asked if she received support to manage the large class her response was *“No, that one you just have to think how you are going to manage”*. Her school is using the GPLMS but from her viewpoint the strategy is meant for the gifted learner not the slow learners. She indicated that it contains a lot of work which runs at a very fast rate and some activities need to be completed in the class and other as homework which makes it difficult for slow learners to grasp and to meet the standard. TD also indicates that she has learners in her class whose age is not appropriate for the grade level; she noted that if learners are still young it is difficult for them to cope with the grade work.

Participant TE was a female teacher with 25 years working experience in teaching. She teaches grade 6 having 33 learners in a class. Like the other participant she criticised the GPLMS for running at a fast pace. She indicated that there is no consistency in the strategy, that is, there is no repetition of topics. The strategy is structured with different topics within a week, and contains lots of work for learners which make it difficult for them to cope. Her mode of intervention/support is to motivate the learners that are struggling to boost their morale, and gives them extra lessons. She also said she simplifies their work and goes down to their level using concrete substances to teach them. She reckons that 95% of the learners grasped information when concrete objects are used in teaching them. Among the challenges she highlighted were lack of parental involvement, language barriers and lack of firm mathematical background from the foundation phase. This was reflected in her words when she laments: *“children lack foundation, I don’t know maybe from grade 1 or 2 but they lack foundation, because I always go back to teach the foundation work that is why I say the work for GPLMS is at fast pace, maybe it not fast but it’s the learners that lack foundation, maybe GPLMS is on the right track but the problem is the learners that lack foundation”*. She has gone through various trainings which include CAPS, however from her point of view the trainings were not enough. She noted that most of the trainings are less than a week and they have to deal with voluminous work.

Participant TF was a female teaching 35 learners in grade 5. She has spent over 30 years in the teaching profession and she will be retiring toward the end of the year. She started teaching in her present school in 2006 and she's the mathematics HOD for the intermediate phase. She reckoned that most learners experiencing barriers are learners that come from other schools to join the school, not those that started with them from the foundation grade 1. Other challenges noted by TF were lack of parent involvement, language problems and one she referred as not being a mathematical rooted problem that is, a social problem. According to her, most of the learners come from homes where health is an issue. She highlighted problems such as HIV/AIDs, unemployment, and other health related problems. When she was asked how she usually handled the situation, she indicated that she usually referred them to social workers; she acknowledged that they don't have the required skill to handle the situation. This was reflected when she said: *"Because sometimes we are not knowledgeable to handle a child with this kind of a problem"*. From her point of view the GPLM strategy is helping learners facing barriers and she maintained that the strategy is at par with learners' age level. She commented on teachers who complained about the strategy by condemning them because according to her GPLMS provides them with a variety of materials to work with and she claimed that they receive adequate support from the coaches. Her mode of intervention was to simplify work by reducing workload for learners who are struggling and to use real objects for illustration.

Participant TG was a female teacher with 15 years working experienced in teachings, teaching grade 4 with 44 learners in a class. According to her the process of including learners facing barriers slows down the teaching process because they have to explain several times to them. She indicates that those learners write in scrap books before copying it into their classwork books which mostly take time. She has a maths extension and remedial programme for intervention where she supports learners by giving extra books where they write their additional work, but she noted that most learners are not coping and they still lag behind. She complains that learners are not cooperating when asked to stay behind for the extra classes; they come up with excuses such as no transportation. The major problem she's facing are lack of parental support, language barriers, and lack of discipline which she attributed to the home environment most of the learners came from. She mentioned that the majority of her learners are orphans who come from an SOS home without proper care and they have attitude problems which they bring to the class and they mostly interrupt and disturb other learners in the class. She acknowledged having adequate training which she admits is helpful. She also thinks that the GPLMS is good and relevant to learners needs however she indicated that it had a load of work and runs at a fast pace.

Participant TH was a male teacher teaching grade 6 having 43 learners in a class. He has less than a year teaching experience. He admits and appreciated the training he has received which he confesses was adequate, he also appreciate the support he's getting from the SBST and DBST. According to him GPLMS is very helpful however he noted it runs at a fast rate for learners especially those experiencing severe barriers. When asked how he supports the learners he responded by saying *"what I do if I see that a learner have got a barrier in understanding in class or in group work that where I check the learner after school or during break, and then try to have face to face teaching, we call it expanded opportunity, this is for those who cannot perform in a class environment but if we are two they will understand"*. During the intervention he simplify the task for them, this expanded opportunity he acknowledges is helping learners that experienced mild barriers not severe. He also supports learners using their mother tongue to teach. The challenges he witness is similar to what others are experiencing such as, language barrier, lack of parental assistance, learners lack of basic knowledge of mathematics from the foundation phase.

Participant TI was a male teaching grade 6 and 7 with classes of 54 and 45 learners respectively. He has been in the teaching profession for the past 30 years. The major challenge he witnesses is language barriers which impede learning. He indicated that the transition to English at the intermediate phase is creating a huge gap in learning because at the foundation the medium was mother tongue. He indicated that when learners first arrive in the intermediate phase they feel lost due to the language difference. When commenting on the situation he said: *"Because the word problem or the word sum in foundation phase were done in Tonga, now when they come to intermediate phase, now they must start doing those word sum and the problem in English, now that become a challenge, is as if they are starting a new school in a new area, whereas they are in the same school all along but because of difference in the language, home language"*. To address this issue he pointed out that his school has come up an initiative in their curriculum to inculcate the English language as a medium. The initiative he added is agreed upon by the school governing body with the support and approval of the DoE and will be starting from next year. According to him the school has already ordered text books containing English language for the grades involved. TI was totally indifferent regarding GPLMS, and was against underperforming schools being assigned this strategy, from his opinion his school has the potency to perform better, however their performances are being hampered given the language differences at each phase. He believes inclusion of English medium from grade R in the school curriculum will make huge difference in their performance rate.

Participant TJ was a female teaching grade 4 and 5, with 57 and 52 learners respectively in the classes. She has 25 years of experience in teaching. Apart from having overcrowded classes,

language is the prime challenge she experiences with the learners, she indicates most of her learners are from foreign countries with little or no knowledge of the English language. According to her it is difficult because these learners have to start language learning before they can understand maths. Her way of supporting the learners is to simplify the work and start from the simplest tasks. She attests to the support she gets from the district and the social work department which she acknowledged is very helpful. She indicated that GPLMS is addressing learning barriers, however, she complained about the fast rate and sequencing of topics which lack continuity. According to her: *“Some of the area was insufficient, let say they say we are teaching about the money, and then you find out this topic is about today only, 1 hour 30 minutes and never come again and the next day is another topic, so you find that this topic come once only just for 1 hour 30 minutes”*. TJ would have preferred a topic to feature more than once, at least three times or run through the whole week for better understanding of the learners. She mentioned lack of parental involvement, social problems and she indicated that most learners lack discipline. She noted that most of the learners neglect their class and homework because they believe they can claim rights and will be covered. According to her they hide under so called ‘rights’ when avoiding their responsibility. When she was asked regarding the mode of disciplinary measure she used to address the situation, she responded by saying *“We discipline them by talking only”*. According to her, they are limited in terms of disciplinary measures due to abolition of corporal punishment, and she noted *“if they do not want to cooperate they know they got their right”*.

4.3 SUMMARY OF THE FINDINGS

Valuable information was generated during the interview sessions with the participants. The profile obtained from the first few sessions of interviews show impressive teaching experience from the majority of the participants which ranges from 0 - 35 years and their age range of 25 - 60 which indicates that they are mature and well experienced. Bearing this in mind, as well as their good qualifications, one could assume that they would have no problems teaching mathematics at the intermediate level, but the findings of the study reveal that most of the participants have experienced challenges so this does not seem to be the case. From the findings it was revealed that intermediate primary school teachers that were involved in the study experienced numerous challenges when teaching learners experiencing barriers in mathematics.

Evidence from the data gathered during the interviews indicates that teachers are providing support/intervention to learners experiencing barriers in mathematics; however, these support/interventions did not yield much gain owing to various challenging factors. Teachers are

confronted with challenges which the educational system throws at them as well as those that spring up from within the school environment. The findings also revealed that teachers need resource materials and adequate support from both SBSTs and DSBTs in order to optimise their potentials. The data from the study shows various holes which need to be mended by the Department of Education because they are impeding successful teaching-learning situations.

4.4 PRESENTATION OF THE FINDINGS

The data obtained during the interviews revolves round the key research question: “What are the challenges in teaching learners experiencing barriers in mathematics at the intermediate phase level in selected schools in Tshwane South district, Gauteng, South Africa?” This data was gathered through qualitative interviews which were carried out with ten mathematics teachers at the intermediate phase. The interviews provided valuable data and four themes were identified. The themes are:

- Educational related issues.
- Teacher related factors that influence challenges.
- Learners’ attributes that influence teaching challenges.
- Strategies available for teachers to support learners.

These findings are presented and discussed below. The exact words of participants were retained in order to enable their real voice and contributions to be heard resulting in comprehensive understanding of their experiences in their professional careers. The themes and categories that emerged from the findings appear in Table 4.3.

Table 4.3: Overview of themes and categories

THEMES	CATEGORIES
Educational related issues	Language barriers GPLMS Overcrowded Resources/teaching aids
Teacher related factors that influence challenges	Identification of strengths and weakness Training issues
Learner attribute that influence teaching challenges	Lack of fundamental math concepts from foundational phase Reading and writing problems social / discipline problems Lack of interest and maths phobia
Strategies available for teachers to support learners	Intervention programmes Active involvement of learners SBST/ collaborative teaching

	DBST Parental support
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4.5 EDUCATIONAL RELATED ISSUES

This study focused on the challenges in teaching learners experiencing barriers in mathematics at the intermediate phase level. In the literature review in Chapter 2 different concepts relating to challenges that hamper pedagogical practice were meticulously discussed, and challenges posed as a result of educational policy was one of them. In the course of data collection for this study various instances and responses were provided which pointed out that teachers indeed are experiencing numerous challenges in their pedagogical practice that emanated from the educational structure and planning.

4.5.1 Introduction

The educational domain across the globe has witnessed tremendous reformation in the past years. Locally various reforms have occurred as identified in Chapter 2. What necessitated the reforms in education is the need to redress and repair the age-old educational system which was characterised with disparity, segregation, inequality and so on. However, reformation comes with its own challenges. For instance, the new pedagogical practice has a link with the constructivist approach which focuses on students as the active constructors of their own knowledge and teachers as guides in the process, concentrating on students learning not on delivery of contents.

Likewise, Piaget’s theory that guides this study believes in active and experiential learning. According to him, children construct knowledge through this process, which is in line with the inclusion approach (inclusivity is the recent shift in education which focus on making educational system cater for all educational needs of the learners and accommodating their differences irrespective of any barriers they might be experiencing). The data generated from the interviews in this study indicates that governmental policy and strategy on education are posing challenges to teachers and handicap them from executing their duties. Those challenges are discussed in detail under various headings below.

4.5.2 Language barriers

Language is the tool which cohere all educational activities; any inhibition in medium of communication will impair learning. The South Africa Constitution (1996, section 29), as mentioned

in Chapter 2 emphasises the right of every child to receive education in any of the eleven official languages in public schools of their choice. The school language policy in South Africa lays emphasis on learning of two languages in a multi-lingual society. The policy requires children to be competent in FAL while they maintain their home language (Department of National Education, 2002). As indicated in Chapter 2 majorities of South Africa schools, especially the township and schools in remote locations adopted mother tongue as the language of instruction at the foundational phase replaced by English at the intermediate level.

During the interviews it became apparent that transition from mother tongue instruction to English at the intermediate level poses a challenge in the teaching and learning situation. All the participants indicate this problem, which they admit is causing huge challenges to teaching. They all indicate that their learners cannot comprehend the English language and this affects the teaching-learning process. The language policy encourages code switching during formal instructional practice; all the same most of the teachers complain that code switch to mother tongue is not yielding much result. This was evidence when participant TA said *"I think language is the problem, because you find that the question paper comes in English but sometimes you have to stop and explain in their mother tongue. They find it difficult to comprehend English and it's killing them, even if you tried in maths class to tell them that we speak English, but when they get to other class they use different language and lack of consistency is not helping the learners"*. Participant TH likewise indicated using mother tongue to interchange during teaching and he was asked if that is helping, he responded that *"Some of them do understand but a lot of them still struggle to understand even with their home language"*. Similarly participants TC, TD, TF and TG acknowledged using mother tongue to interchange the medium of English during instructional practice, however they noted that there is not much improvement in learners' situations. Although the language policy supports code switching the literature review indicated that English second language learners whose mother tongue language is insufficiently developed are not likely to flourish academically.

Moreover participant TA explained that the language problem faced by learners hindered performance because mathematics questions come in English language which most learners find difficult to comprehend, and according to him the terminology used in most cases were a bit high for the learners. He illustrated this situation during the interview when he said: *"language is a challenge they don't understand when you teach or say something in English they just agree but when you give them work they will say, 'o itseng' You just have to go back and explain in their mother tongue, it also wastes a lot of time because you have to explain again, you just have to go back again and only a few really understand"*. Participants TB shared the same problem which was

revealed when she said: *“You know like I think um... the language barriers I think like the foundation phase I don't know the other learning area but especially mathematics I think they are using mother tongue in the foundation class and then when they come to grade 4 is like the gap, I think is cause by the language barrier because in grade 4 you have to teach them in English, is now when they struggle a lot when you use those term like multiplication, division you know!”*

Participant TI complained that the transition to English at the intermediate phase leaves a huge gap. According to him learners feel lost due to the language differences. He presented a scenario where learners were asked to 'add' in a mathematical word problem and the learners were confused because they cannot decode the meaning of the word "add". He noted that they used to know it in their mother tongue, he expressed that *“the word ‘tanganisa’ in Tonga means ‘add’ in English but this learners when they hear the word add they don't understand that it's the same meaning with tanganisa, so they get lost when they changes from tanganisia to add, is as if they are doing totally different thing”*. As acknowledged in Chapter 2, learners' capacity to learn and think relies on their ability to understand language. Therefore, in a situation where learners find language of instruction difficult, learning will be inhibit. Participant TI further commented that this condition impedes teaching and learning as reflected in his statement when he said: *“So that make them to be very, very slow in writing because they are trying to grasp the language and at the same time have to learn multiply or divide, so that create a serious problem”*. Participant TE recognised that English language is a barrier to learners. She admitted that learners have a tendency to understand mathematics but language is causing a barrier.

Participant TJ's situation is quite different as her class contained numbers of learners from foreign nations. She indicated that learners from Zimbabwe are better than most and can comprehend English during instructional practice, however learners from Mozambique present a challenge to her in class as she noted in her statement: *“those who are from Mozambique, in Mozambique they use Portuguese so it difficult for those learners that come to grade 5, because to know the learning area they must first learn to know English, so the whole of the term they will be struggling”*.

The comments highlighted above by the participants certainly indicate that transition of medium and language differences at the foundation and intermediate phase are contributing to the challenges experienced during teaching and learning situation. As teachers mentioned, the majority of the learners come to intermediate phase being impaired in language which invariably impedes instructional practice, indicating that their mother tongue language is not well developed. As indicated in Chapter 2, language skill result from development of cognitive (mental structures), and the cognition growth order and quality will therefore dictate the child's language development order

and quality. According to Piaget (1970) babies do not possess intricate language structure from birth, so his stance is that cognition is not inborn but results from development. This means children develop language acquisition as their mental structures advance so it is imperative for the DoE to ensure proper language teaching at the foundational phase so that children can develop the right form of language to qualify them to benefit academically and also, as some participants suggest, to inculcate English medium right from the foundational phase, as these will lessen the challenges posed by language differences and foster teaching and learning.

4.5.3 GPLMS

Gauteng Primary Language and Mathematics Strategy (GPLMS) is an initiative of the provincial government of the Gauteng Department of Education and is a plan to improve language and mathematics in schools that are performing poorly in the Province to ensure that learners are able to read and write by the time they complete their primary schooling. This initiative came about when President Jacob Zuma of South Africa in 2010 identified that the achievement of primary schools is the national priority and targets were set for the Department of Basic Education to make sure that 60% of learners performed at grade level by 2014 on the ANAs for Grades 3 and 6. As indicated in Chapter 2 this strategy is envisioned as an intervention allowing Gauteng schools to achieve the 60% target set by the President for learners attaining the proficiency levels require in Language and Mathematics in Grades 3 and 6 by the year 2014.

However, the responses that emerged from the participants revealed both positive and negative aspects of the strategy. Eight out of the participants shared the same view that the strategy has assisted them a lot in improving their teaching skills and reducing their workload because it comes with readily available lesson plans that are well explained and are an easy guide for teachers. According to them the strategy also contained varieties of work to engage learners and to improve their learning skills in mathematics. Participant TA indicated that the strategy is teacher friendly and eases their work with readymade lesson plans and varieties of examples. He has this to say regarding the strategy: *“There is a lot of examples and strategy in GPLM, a variety of example actually, and it explains from the topic, umm from the beginning up to the end. And guide you the teacher on how to start your lesson, what activities to give or which book to refer to. Because it also includes the DBE book so if learners don’t understand the textbook you can also give the DBE work to emphases more”*. They also believe that the strategy is relevant to learners’ age and needs except participant TB who is of the view that the content is a bit high for grade 4 learners. She said: *“I think it is*

relevant but you know sometimes when I check on the, like the grade 4's I think sometimes the contents it a bit above them, yeah I think it a bit above sometime, yeah but it's relevant".

Participant TI is sentimental regarding the strategy. He is indifferent about GPLMS, and according to him his school should not come under the auspices of being an underperforming school in the first place, as he attributed their performance inadequacy to medium of instruction which is what he thinks needs to be addressed. Educational White Paper 6 (DoE, 2001: 31-32) acknowledged that curriculum can create notable barriers to learning and exclusion for many learners due to intertwining parts of the curriculum, like style of teaching, pacing, and time frames for completion of curriculum, which is why the policy has come up with a flexible curriculum and assessment policy to accommodate diversity so that all learners can access the material regardless of their learning needs. Participant TF has no complaint regarding the strategy. From her point of view GPLMS is meeting both the needs of teachers and learners and she believes people complaining about it have an attitudinal problem. She said: *"people are just talking about it that it doesn't cater for learners the problem is that those who are complaining about it maybe it's because of overcrowding, but with us here everything is fine because I can move around and then"*.

The majority of the participants criticised the GPLMS for running at a fast pace, containing lots of work for learners and not having continuation in terms of topic sequences. This contradicts the policy of inclusion which indicates that curriculum, teaching method and assessment should make allowance for and accommodate all learners. However, according to the participants, the GPLMS's time pacing and workloads are not accommodative to learners experiencing barriers. When participant TE was asked if the learners were coping with the pacing, she retorted by shaking her head and said: *"No, the intelligent ones, the intelligent ones they grasped"*. She also responded to the issue of the strategy containing a big workload for learners without repetition in topics by saying: *"the problem is this they don't have rehearse maybe today we are doing multiplication, then tomorrow we are doing other thing there is no repeat of the work, in a week there is a lot whereby the learners don't catch up"*.

In addition, participant TJ stressed that *"Some of the area was insufficient, let say they say we are teaching about the money, and then you find out this topic is about today only, 1 hour 30 minutes and never come again and the next day is another topic, so you find that this topic come once only just for 1 hour 30 minutes"*. Regarding the strategy containing a lot of work participant TD mentioned that *"there is a lot of work, it need the gifted learners, because we have to do mental maths after mental maths teaching after teaching class work activities and after classwork activities, the homework same time we have to do all of that, so for the slow learners ah! Is a much work it's*

hard for them". Participant TA also contributed to the point on GPLMS's fast pace when he said: *"The pacing is the one am worry about because there are so many topics, and then the book says little. I think the more they do it is much better, so the book is also at fast pace. I don't believe that we need to rush in completing the book the learners need to know what they are learning. Because it's not about the finishing line but knowing what is the race or what you are racing for"*.

Participant TB acknowledged that there isn't enough time for learners to accomplish their work. She revealed this when commenting on GPLMS work load: *"I think the problem is time, we have to go quickly, quickly and then you find the other learners still behind because they are still struggling with that topic but time is pushing you to go to the next topic."* TG concluded by saying: *"learner having barriers need small amount of work they don't need a lot of work"*.

It should be noted that at the time of this study the GPLMS had stopped running, however majority of the participants were still using it for their lessons. This was indicated by participant TJ when she said: *"this year we are not using it, but they say we can use that lesson plan, even the test we have use the test by the first term but the second term they have given us a common exam not that of the GPLMS"*, and she further emphasised that *"just because they say they wipe it out, next term we are going to set our own test, and we can use the GPLMS as a reference because we are used to use it"*.

Clearly it was indicated from the findings that the department has put a strategic plan in place to support teachers and improve learners' performance in mathematics. As indicated in Chapter 2, GPLMS has the potential for improving learners' performance with the quality of supportive learning materials that are arranged in line, the lesson plans and provision of coaching. The fact that most of the participants still use it even at the time of the study indicates the strength of the strategy in influencing teaching and learning positively. However the gaps pointed out by participants pin point the challenges teachers are experiencing when they are providing intervention to learners using the strategy. Considering these criticisms, Gauteng Department of Education should step in and review the strategy, not stop it completely. They should revise the strategy to properly accommodate all learners especially those experiencing barriers who were to be the original recipients of the strategy.

4.5.4 Overcrowded

The Education White Paper 6, as reviewed in Chapter 1, stipulated that our constitutional responsibility is education for all learners and that learner who experience barriers to learning should participate fully as school community members and should be provided with quality education through effective teaching and given all necessary support. White Paper 6 further states that all children are entitled to receive quality education and support, and teachers are expected to

accommodate and provide for a diverse range of learning needs. However in a situation where classes are overcrowded and flooded with huge numbers of learners that require attention due to learning barriers, this situation will leave teachers with no choice but to work within their capability. From the interviews it was found that huge numbers of learners in the class hinders teachers from paying individual attention to learners experiencing barriers.

Participant TC complains of having 64 and 50 learners in grade 5 and 6 respectively. He mentioned that he was unable to give individual learners support due to crowded classrooms, as revealed in this comment: *“you find that the teacher can’t even walk round the class to give assistance to learners who are struggling”*. Participant TD also experienced a similar situation which she lamented: *“It is so painful, it so painful you know, I feel it for them especially with this one of my 58 learners in one room, you see now if there is one at the back who is not writing, you can’t walk, it not easy to walk through the desk, yah is full”*. Overcrowded classes can result in learners having barriers not being identified for the necessary support because teachers are unable to get across to those learners. Participant TB maintained that in situations where huge numbers of learners are facing barriers in the class it is difficult to attend to them individually, as can be seen in this comment: *“addressing individual barrier is a bit of a challenge”*. She also added that *“There’re a bit of them especially in grade 4”*. Participant TB indicated that she had quite a number of learners experiencing barriers in her class which prevented her from giving each learner individual assistance.

4.5.5 Resources/teaching aids

Teaching aids/resources are a necessity in teaching as this stimulates learning and enables learners to concentrate better. As was indicated in Chapter 2, Piaget’s concrete operational stage which intermediate phase learners’ fall into, and which the study focused on, relies basically on concrete manipulative substances with which to learn. These learners rely more on the physical substance they can see, feel and handle to solve problems and they learn better when they get exposed to such things. It was also noted that some of the formal operational children are still tied to the concrete phase, so their learning of mathematics will be accelerated if they have the chance of experiencing substances that can be manoeuvred during learning. Participant TA buttressed this statement and reckoned that learning is much easier for his learners when he teaches them by showing them concrete material. He said: *“when I was teaching fraction it was much easier when I draw the picture of a brick showing them that if you take 4 and then take 3 the fraction is $\frac{4}{3}$ ”*. Also TE acknowledged that *“I can say 95% of them grasp when concrete objects are used in teaching them”*. Similarly, participant TF acknowledged the use of concrete objects when she said that *“then*

we use real objects to teach them, when teaching like 3d's or 4th's let the child see it like the cube and a square, when teaching square let the child see the four side of the square where it gon'na be real for the child". In the same vein participant TJ mentioned that teaching resources facilitate learning, as reflected in this comment: "I must have the resources, like the picture or the teaching aids; I try to use all the teaching aids. If I say these I show them, like orange we are cutting these into two what are we going to have? We are cutting it into four what are we going to have? Most of them if you have a picture in front in a class he or she will understands clearly rather than talking without a picture or teaching aids".

Teaching aids foster active participation of learners in the teaching-learning process. This was indicated when participant TA said: *"in the DBE book there was this other game about place values I use to teach it and they enjoy it, they actually grasped what's happening about it because they are involved. Because when they enjoy it more it get inside their brain and they also see it, unlike me coming into the class and telling them to do this and that".* However, considering the efficiency of teaching aids and the way they stimulate learning, most of the participants complained of lacking adequate teaching aids/resources materials with which to teach, as most of their learners rely on physical substances that can be seen and felt for better understanding. The situation was exposed when participant TB said: *"you know I wish the district can support more like provide us with the teaching aid like the chart, you know like the different teaching aids, because I've realise that like the grade 4's they need things like touching, seeing, if the district can supply us with these things it will be much easier for us".* Participants TA, TD, TG and TI reckoned that lack of teaching aids is making their work difficult, this was evidence in participant TG's statement: *"mostly we don't have enough teaching resources to help those learners with barriers".*

As indicated in Chapter 2, the GDoE inherited disjointed and dissected functions from the erstwhile educational systems which resulted in uneven and differentiated quality and resource allocations. The current dispensation has sought to redressing inequity in resource allocation and use education as a focal point for socio-economic and education reforms. According to the DoE (2005:23) school based support teams were responsible to provide explanatory learning programmes and learning support resources. However from the findings it is evident that the DoE is far from achieving its aim of equitable allocation of resources because inadequate and lack of resource materials were one of the prime features of teachers' challenges revealed in this study.

4.6 TEACHER RELATED FACTORS THAT INFLUENCE CHALLENGES

The participants were asked which approach they are using to determine their learners' weaknesses and strengths and what training they undergo. This question was asked to help answer the sub research question of what are the teacher related factors that contribute to challenges in teaching mathematics to learners experiencing barriers.

4.6.1 Introduction

It was asserted from the literature review that diagnosing of learning barriers are not negotiable and early identification can help alleviate the barriers. Assessments techniques were emphasised which helped to identify/diagnose barriers in mathematics and assist in monitoring learner's performance to gather information regarding their strength and weaknesses, likewise this will enable teachers to decide on the appropriate teaching strategies and invariably reducing teachers stress. The NCTM (2000) asserted that assessment is essential in mathematics teaching and learning and contributes to realising effective mathematics teaching. It helps teachers understand what their students already know and what else they need. Learners experiencing learning barriers need to be assessed prior to provision of support in order to detect the areas where they lack and to determine their exact requirements.

4.6.2 Identification of strengths and weaknesses

To identify learners strength and weakness all the participant indicate using assessment. It is important to carry out assessment continuously and assessment must adhere to educational policy. The major aim of school assessment was to finds and provides support for learners who experience learning barriers so that all learners can intermingle, and for assessment to inform the process of teaching and learning (DoE, 2008: 2). During the interviews all the participants mentioned administering of assessments ranging from classwork activities, exams, and homework. Participant TG said: *"We have classwork book we have DBE book we have assessment task book, mostly I use the class workbook to assess them because we have to write assessment task at the end of the day"*.

As previously stated assessment should inform teaching decisions and determine what learners already know and need to know. Equally it was pointed out in the second chapter that teaching which is informed by quality of assessment data is an effective way of improving learning outcomes. Participant TA indicated using initial assessment which he referred to mini tests to identify barriers in order to prepare the learners for support. According to him: *"like I said I use mini test, sometime I also make them do small project just to see if they understand what it's happening"*. Participant TE

said: *"I use mark sheet to identify their mark and then if I see that it low I will take them for extra classes"*. Participant TH added that *"I personally point to them so they can come to the board to do it and then I can see that this one needs one on one intervention"*. Participant TI further stressed that time enables him to identify learners having barriers; he indicated that learners having barriers were unable to complete their tasks within stipulated times and they write wrong things even if they are given enough time to accomplish the task.

The findings indicated that teachers were administering assessment of learners, but none of the assessment tools highlighted by participants seemed to be following the guidelines for administering the assessments. Given the fact that most of them indicated experiencing challenges raised the question of whether the type of assessment they carried out in their individual classes accurately evaluated and reflected the true nature of the barriers their learners are experiencing. However this affirmed the observation of Mkhuma and colleagues (2014) in Chapter 2 acknowledging that teachers have challenges regarding how to identify learners who are experiencing learning barriers. The DoE (2008: 1) specified that inclusion is not only applicable to curriculum but also stretches to assessment in the class and external assessments, further stating that assessment tasks in the school must be structured and modified in a manner that will address the barriers. The DoE (2005) maintains that if educators are the chief players in the course of identifying and addressing barriers to learning, they require training on what are barriers to learning, and ways of identifying them.

4.6.3 Issues of training

Participants were asked about the training they received before implementing GPLMS in their various schools. All the participants mentioned that they went through one form of training or another. However some pointed out they did not attend GPLMS training but attend an on-going training. These were indicated when they commented on the issues. Participant TB, TF and TH indicated they went through training and they appreciate the coaches that trained them for GPLMS. This was reflected in a statement by participant TB: *"they did send us for training, and then we use to have some coaches who were coaching us and they were doing it very well"*. Likewise participant TG said: *"I do attend on-going training but not GPLMS, the training was very helpful"*. Similarly, participant TA said: *"we are still attending the (PLG) it is on-going training where we share ideas and challenges, and help each other to solve problems. This meeting is helpful because we help each other by sharing ideas"*. Participant TA did not attend GPLMS training but he attests that professional development training that he is attending continuously is very helpful.

Participant TC affirmed that the training is adequate as evidenced by this statement: *“it was enough because we have gain a lot, and then the training was all about activities of the teachers in the interest of the learners and activities of the learners, so the training assist us a lot”*. TI had a different view of training, stating that the training was not sufficient. He said: *“Not adequate for teachers, because it was one week training. You must understand that the person who trains you for GPLMS might not be the best person. Even the trainer might be training you but you can see that you are much better than them or maybe more quality than them, you can see that they are not well prepared, that is another problem we experience during the training”*. Participant TE concurred, saying: *“No it’s very little because it lot of work within a week”*. Although participant TD valued the training, she indicated that time allocated for it was not adequate, as noted in her comment: *“even though there was not enough time because we only go there for three day but we gain a lot”*.

Professional development of teachers is crucial and must happen continuously as this will empower them and give them a clear understanding on how to implement any new innovation or strategy.

4.7 LEARNER ATTRIBUTES THAT INFLUENCE TEACHING CHALLENGES

During the interview the teachers were asked to indicate other factors which aggravate the challenges they are facing during their pedagogical practice in their classrooms. Various factors were enumerated relating to learner attributes influencing teaching challenges, as discussed below.

4.7.1 Introduction

In the process of addressing learning barriers teachers experience challenges which the learners present that hindered successful teaching and learning situations. Among the challenges enumerated were the lack of fundamental mathematical concepts from foundational phase, social and disciplinary problems, lack of interest and phobia for mathematics and problems with reading and writing.

4.7.2 Lack of fundamental mathematical concepts from the foundational phase

As previously stated in Chapter 2, children start learning at an early stage in life. Mathematical learning begins from infancy. Knowledge of numbers, which is the hallmark of all learning, starts at this crucial stage. It was gathered during the interviews that teachers are facing various challenges which they attribute to lack of a firm background in mathematical concepts which emanated from the foundational phase. The majority of participants criticised the foundational background of their learners claiming that their mathematical foundation were very weak. They indicated that most of

the learners fall short of basic concepts which they are supposed to have acquired right from the foundational phase.

Furthermore, the participants also complained that most of the learners could not perform simple mathematics operations. As indicated by Piaget in Chapter 2, regarding the preoperational stage, this stage marks the development of skills that enable children to perform higher mathematical operations where they develop one to one correspondence which helps them to learn counting, adding and subtracting. Lack of basic operations in mathematics from foundation phase was reflected the following comment from participant TH: *“so that when they reach grade 4 things have to change, we are going to start to talk about measurement, we are going to talk about time, we are going to talk about angle, we are going to talk about umm---, things have to take another shape. So we are to come from the foundation phase knowing that I can count from 1 up to 1000, if a person is in grade 4 and cannot count up to 500 wish mean we have got a problem”*.

Likewise participant TE indicated a lack of basic concepts from the foundational phase when she revealed instances where she has to go back to teach concepts the learners were supposed to have acquired right from the foundation phase. This was evident in her words when lamenting that *“children lack foundation, I don’t know maybe from grade 1 or 2 but they lack foundation, because I always go back to teach the foundation work”*. However, participant TH believed that teacher quality at the foundational phase determines what learners learn. He indicated that most learners repeat when they get to grade 4 because they lack basics. He believes two teachers should be teaching foundational classes with one specialising in mathematics. The deficiency in learners background he linked to non-qualified personnel teaching at the foundational phase, as is evident when he said: *“let’s concentrate on the foundation phase, in foundation phase let take the person who is teaching grade 3, 2 and 1, that person is teaching all the subject in the class, so is that particular person qualify to do mathematics or how to teach learners mathematics or numbers”*. Participant TB concurred with his view when she revealed that *“I think the other problem is like most foundation phase teachers are not specialised in particular subject like especially maths”*.

During the interviews the majority of the participants pointed out that specific area in mathematics are posing problem for the learners and these can be traced back to learner background in mathematical concepts. The participants stated that learners find it hard to differentiate mathematical signs and symbols and they often add if they are asked to multiply, and in fractions they usually omit the division line and they add instead of dividing. Participants TB, TD, TF and TJ revealed that division is a problem for the learners and that even the simplest division was a problem for the learners. Participant TI said *“learner experience problems in long division especially*

those with barriers, I have tried a certain method which is a bit helpful, like when you say to learner $1426/12$ (writing it down)". He further emphasised that the majority of his learners were struggling with fractions, as reflected in this comment: "Fraction is one difficult thing for them for example they don't know the dividing line in fraction instead of them to write like this $2/4 + 3/5 =$ (he illustrate by writing the figure) most of them omit the dividing line which make it hard for teacher to determine what the learner is trying to solve and by removing the dividing line they add instead of dividing and this is no longer a fraction, so you see!".

In addition, participant TE mentioned problems with long division and times tables. According to her, "Long division is a problem for the children, times are also a challenge for them, I have tried so many different methods but it's not working I don't know what went wrong". She further stressed that "Children don't understand place value, for example if you give them $562 - 67 =$ (she wrote the figure down to illustrate) they cannot solve this because they don't know the place value". When participant TE was asked what could be the cause of these problems, she acknowledged that "children lack foundation". This affirmed what Machaba and Mokhele (2013) indicated in the literature review regarding grade 3 learners from underprivileged schools in Tshwane South District, that a large number of learners cannot carry over units to tens and tens to hundred. Participant TH responded to the same question when he stated: "What I said earlier, problem from the foundation most of these barriers should have been identify from the foundational phase and they can be place in special school". Participant TC also indicated that "Yes, yes, we experience a lot of challenges when it comes to maybe multiplication table and division, so if a learner cannot multiply, its means the leaner will find it difficult to divide". He further illustrates: "if $6*5=30$, on the other hand I said 30 divide by 5 what is the answer, so it make it easier for them, but if they don't know how to multiply and divide then there is a lot of problems".

When participant TC was asked how he usually addressed this type of situation, he responded: "We use to teach them, that when you see the word sum, and see the word add you should know you are going to add, so when you see the word subtract, or the word difference you are going to subtract. And when you see the word divide, but the only problem is that sometime they don't know how to solve that, how they are going to approach that type of a problem solving is the only problem for them". Participant TH contributed further on the issue by saying: "if you twist question in the class like let say $1/3 + 2/4 =$ and if I change it to $1/3 + 6/12$ those learners with barriers get confused". This statement affirmed what was inferred by Piaget in the theoretical framework relating to reverse thinking – Piaget's second stage are learners who's thinking is still tied to one direction only and they have challenges in seeing other perspectives, but intermediate phase learners fall under the third

and fourth stages who, according to Piaget, can reverse, conserve and seriate. From the above comments by the participants it can be deduced that most of these learners were lacking foundational concepts/skills in mathematics. Basically the above comments also reflect the frustration teachers encounter in the process of instructional practices, however, most of the problems mentioned above can be traced back to the foundational background of learners and their language inability.

4.7.3 Problem with reading and writing

Reading and writing skill are crucial in learning; deficiencies in these skills seriously hamper academic performance. However, participants complained that the majority of their learners could not read and write even though reading and writing are basic skills which are required in performing most of the mathematical operations at the intermediate phase level. A child that lacks these skills will struggle in class. Although participants in this study were mathematics teachers, they recognise that mathematics questions mostly come in words which require learners to read and comprehend and sometimes require that answers be written word format.

Participant TD noted that the learners experiencing barriers in her class related to reading and writing slowed down the teaching process. She said: *“especially for the ones that cannot read the word problems, they cannot read, cannot write, they cannot finish their work”*. Participants TB, TF and TJ also pointed out their learners’ inability to read and write. Participant TF identified a learner in her class who was good in solving mental mathematics; she compared the child brain to calculator, however, she noted that this particular boy had a problem with language which was revealed in her interview when she said: *“his English is very poor instead of writing ‘day’ he will put it upside down”*. TF continued further to stress that *“you see the challenges we are facing some of them are good with mental maths but don’t give them word sum is a problem they gon’na get it wrong, the problem is they cannot read and write they’ve got the problem of language”*.

Furthermore participant TA pointed out that some of his learners were able to explain mathematics questions better verbally. He said: *“There’re some when you sit with them they can explain to you but when they have to put it done it’s another story, I wish it were possible for us to maybe umm... record and mark, yah! I don’t know if it’s possible. But when they are talking they say the right thing but when they have to write it, it’s become difficult”*. Equally, participant TG added: *“if ask them orally they can do it but they cannot read and read”*. Likewise, participant TH said *“you can find a kid in grade 4 who cannot read and write even with intervention there is no improvement”*.

However participant TI indicated that in his school they encouraged all the teachers to help build up the reading and writing skills of their learners. This was noted when he mentioned that *“we are trying to make sure all the teachers try to help all their learners read so to improve their readings ability, learners make a lot of spelling mistakes, we don’t consider spelling in maths but we try to emphasis correct spellings to reduced wrong spellings”*.

4.7.4 Social and disciplinary problem

The participants were asked what other contributory factor aggravates the challenges they faced in mathematical class. Most of them pointed toward social and disciplinary problems. Participant TD, TG and TJ complained about the disciplinary issues in their schools. According to them, removal of corporal punishment put them in an awkward situation in choosing appropriate measures of discipline and learners’ erroneous inclination to ‘rights’ makes things worse for them. This was reflected when TJ explained: *“Most of these days’ learners know the right but do not know the responsibility, am not supposed to go to the class in our days not doing my work when teacher come with a stick, but these they are having their right, I teach, then off I go. Whether formal or informal task if he or she wants to write he will, they do as they like because they got right. We discipline them by talking only; if they do not want to cooperate they know they got their right”*. She commented that the learners do as they please even regarding classwork and activities and the problem is compounded because they are not allowed to carry out the disciplinary measures which she felt is appropriate.

TD attributed her discipline issues to large class size when she said: *“the large class is not helping, the noise in the class eish, we are not allow to punish them, the removal of corporal punishment make things worse, when I discipline learner that make noise in the class they know all that I do is make them do simple thing after that immediately they continue with the noise”*. Participant TG believes that social problems might be the cause of the undisciplined behaviour in her class as the majority of the learners come from dysfunctions homes and orphanages without proper care and supervision, according to her: *“They have social problem because they are staying at shelter home, so many learners live in orphanage homes, they have their own behaviour and they do come to class with bad behaviours, they are not discipline”*.

TJ explained further that most learners are uncooperative in class due to dysfunctional home backgrounds. The attitude they acquire as a result comes to school with them and they become bullies and destructive in class. She gave a scenario of two brothers in grade 4 and 5 who always bully and disturb the class; she noted that their undisciplined behaviour is as a result of their family

background. This was revealed in the following statement: *“I have one of the boys in grade 5 he was like a bully, when I am busy teaching he will be grumpily at the back, until I go to the HOD to report him, his brother in grade 4 is like the one in grade 5 when am teaching these learners they don’t listen, and I ask what is happening, he says their mother is mentally ill”*.

Furthermore, TB added socio-economic problem of a learner’s family creates barriers to learning. As she says: *“like most of them, they come from poor family and some of them like they come to school maybe not having anything to eat from home”*. TF concurred with her when she explained: *“Um-- some of them are not mathematically rooted problem, um-- the problem are social one, I do refer them to um-- to our social worker”*.

The above statements reveal teachers’ frustration when dealing with undisciplined behaviour in their classes. It was evident that this situation interferes and distorts the instructional process as the teachers have to stop instruction in order to address the issues.

4.7.5 Lack of interest and maths phobia

Lack of learner interest and maths phobia was revealed during the interview when the participants were further probed on the additional factors that could be posing a challenge in mathematics class. From participant TA’s point of view, learners’ interest is crucial in any subject. He indicated that learners have a lack of interest and they have phobia when it comes to mathematics, as evidences in his remark: *“other challenge is the learners themselves, they have this phobia, and there this thing going around that maths is difficult, I always tell them to forget their previous fear and marks”*. He continued further by saying: *“learners this day don’t have dreams, is like they are being force to come to school”*. Participant TH added: *“Even learners themselves have negative attitude toward mathematics and they discourage other with their attitude”*.

In addition, participant TH emphasised: *“What I observe is that we African people if they can say at home that mathematics is difficult the learner comes to school with the idea even if you give them a task they will say my mother and father says there’re such people who are born with mathematics, but such is not truth, instead of encouraging we are discouraging but I think we should start to be positive about maths and motivate the kids”*.

4.8 STRATEGIES AVAILABLE FOR TEACHERS TO SUPPORT LEARNERS

Questions on how participants were assisting learners experiencing barriers and how they were being supported to help learners during their pedagogical practice were addressed during the

interview sessions. The participants indicated various intervention strategies they were using. However most of them believed they needed to be supported more, especially by parents, SBSTs and DBSTs.

4.8.1 Introduction

The essentiality of support cannot be overemphasised. The Education White Paper 6 (DoE, 2001: 17) pointed out that the inclusive system is about giving support to all learners, educators and the whole system in order to meet the full capacity of learning need with emphasis on development of good teaching strategies that will be beneficial to all learners. Chapter 2 described support as all actions that accelerate the school capacity to attend to diversity, and that alleviation of challenges that emanated from teaching practice is a collaborative effort which must involve collaborative activeness of major players rendering their utmost support to optimise teaching-learning situations. This section looks at the support strategies that are available for teachers which can help them to meet the needs of learners experiencing barriers in mathematics in order to optimise teaching and learning situations.

4.8.2 Intervention programme

The Education White Paper 6 (DOE, 2001: 16) was premised on the basis that all children and youth have the ability to learn and they all need support and all learners differ regarding learning needs. Support is necessary for all learners to enable them to maximise their academic potential. The question of how teachers were supporting learners that were struggling in mathematics was posed to the participants. The responses illustrate different support strategies. Most of them arranged extra lessons which they indicate normally take place during break and after school. Participant TC mentioned having weekend classes for learners experiencing barriers. He said: *“we also attend during Saturday starting from 8 0 clock to half past 10 to assist learners who has this type of problem, who are having learning barriers”*.

Participant TA’s response on how he supports learners was: *“We have design umm... intervention books, in the first term we notice those one who are not performing well then we give them the books, and as you teach them with the rest of the class they have two books unlike the other learners whereby they write their extra work, the intervention given to them on the other book”*. Participant TB said that she always calls for her colleague’s assistance in supporting learners experiencing barriers because she thinks those learners might better understand the teaching approach of her colleague. Her reaction regarding learners that required support in the class is captured in the

following comment: *“yeah, yes it a bit of a challenge to support, because honesty they are different, you know you cannot address one child or give attention to only one child they are like numbers of them in the class, you cannot give attention to a particular child and neglect others yeah, addressing individual barrier is a bit of a challenge but we try and try by all mean to attend to all of them but it not easy”*. Participant TD added: *“I used to take them in the afternoon for extra classes from 2 o clock until 3 o clock and then give them a lesser work like err grade 2, grade 3”*.

Participant TE and TF recalled simplifying the work of learners experiencing barriers and using concrete substances to teach them, illustrated by the following statement from participant TE: *“let say am teaching multiplication and I notice that a learner has got a barrier, I stop with what am doing and go back to the tables, after that I simplify maybe the question is a bit above them, that is I go back to their level”*. Participant TG similarly explained: *“umm, I have a programme, maths extension and remediation, I have a maths extension and remediation books where they write umm, I give extra work I mean I give them expanded opportunity so they can catch up with other learners”*. Participant TH said: *“what I do if I see that a learner have got a barrier in understanding in class or in group work that where I check the learner after school or during break, and then try to have face to face teaching, we call it expanded opportunity, this is for those who cannot perform in a class environment but if we are two they will understand”*. He further stressed: *“What I do first I plan and make the work simple so they can understand, I cannot give them difficult task like those who understand I give them do simpler task but similar to those difficult ones so that they can gradually step by step learn because if you give them difficult task with those who can do it they won’t be able to do it.”* Participant TJ shared her own style of intervention when she indicated that *“I tried to make them feel comfortable, so that he or she will ask each and every question, like a grade 6 I teach him as if am teaching grade 3 learner”*.

However, when the participants were asked whether their support strategies were helpful to learners, participant TG responded: *“even though they don’t cope with that, it is very difficult because some learner still experience barriers I use extra classes and expanded opportunity but some of the learners don’t participant”*. Participant TD had a different experience to participant TG, as illustrated in the following comment: *“Yes it is working even though is slowly but it is working”*. Participant TB added to this by saying: *“they are improving but at a slower pace, but some are not improving at all I think it is like they do have a problem”*. Participant TC concurred with others by saying: *“to me it’s working because most of the learners that participated are highly motivated and then, especially on Saturday where we have time, enough time to teach them we can see improvement in their performance compare to before”*. Participant TJ opined: *“Yes it working, so but*

those who are more severe you will find that it more difficult, but those in the mild level it is working, for the severe ones it not really working you will find that these one they need the special school”.

The Education White Paper 6 (DoE, 2001: 10) clearly outlines what support learners require, and directives regarding the educational support system needed. However, the above comments from the participants give the impression that some teachers’ mode of support/intervention were randomly picked, unconventional and unjustifiable, indicating that they still need clarity and understanding on how to support learners experiencing barriers. This affirmed what was mentioned in Chapter 2, that many teachers lack guidance on how to use the strategy of Screening, Identification, Assessment and Support (SIAS), it necessary to equip teachers on how to give proper intervention/support to learners experiencing barriers.

4.8.3 Active involvement of learners

Another strategy the participants used to support their learners was by involving them actively in the teaching and learning process. Piaget’s learning concepts are based on activeness of learners in the learning process which is assumed to facilitate knowledge acquisition and retention. Participant TA reckoned that when he engages his learners in the teaching and learning scenario knowledge is retained. He said: *“they actually grasped what’s happening about it because they are involved. Because when they enjoy it more and it get inside their brain and they also see it, unlike me coming into the class and telling them to do this and that”.* Most of the participants mentioned the use of concrete substances to fostered activeness of learners and that this also enhanced understanding. Participant TE indicated that *“sometime I use concrete objects”.* Participant TA claimed that if learners see illustrations in the form of diagrams they will perform much better. Peer grouping is another form of enhancing learner involvement. According to participant TB this enables them to discuss and exchange ideas among their peers which, she believes, facilitates the process of learning and knowledge acquisition.

4.8.4 SBST/collaborative teaching

Teachers support is imperative in the school system. As indicate in the Chapter 2 of this study, White Paper 6 recognises the establishment of school based support teams to equip teachers in managing learning barriers in their classes (DoE, 2001). According to UNESCO (2003) giving support to educators is an important aspect in developing a more inclusive centre for learning. Questions on how school based support teams are helping teachers in their respective classes came up during the interviews. The following comment from participant TA showed that he was not getting support

from the SBST: *“I think we are helping ourselves especially in maths (laugh...) because we are the one who identify our own learner in our subject, then we will be the one to make sure they get extra work, the support work they need”*. Participant TB highlighted the importance of support/collaborative teachers when she pointed out: *“Like at times when I see that they are still struggling, I always called my colleague to assist with the one struggling while I focus on the rest of the class. Sometime I see that his method is helping those struggling”*.

According to DoE (2005: 37) the central purpose of SBSTs is to ensure support during the process of teaching and learning. Their functions are to coordinate the support in the school, collectively identify barriers to learning and develop strategies to address barriers. However, this was not what participant TA experience in his school. Similarly, participants TB, TE, and TG mentioned not receiving adequate support from their school based team; TB and TE revealed that their respective HODs were not specialised in mathematics which made it difficult to get adequate help from them. This is evident in this comment from participant TB: *“also most of the HODs are not specialise in mathematics so they are not really helping us”*.

Opposing the abovementioned responses, participant TH recognised and valued the support he’s receiving from his school SBST. He said: *“the other grade teacher comes in to render help when I see that a lot of them are having problems, I can realise that sometime my approach might not be helpful for those learners, she may come with different approach to help them, but still there are some that still got challenges but her assistance help a lot, even the HOD of mathematics assists a lot”*. Participant TD concurred by emphasising: *“Okay you see the principal and HOD supports us”*.

Participants TC, TF and TJ likewise acknowledged the support they were getting from their colleagues. Participant TF indicated that her English teacher colleague came in to render assistance to learners as she recognised that language and mathematics are interlinked. Collaborative teaching and support from SBSTs helps to improve pedagogical/instructional practice. Some of the participants noted that their colleagues’ approach might be helpful to their learners and teachers also learn different approaches from each other when they work cooperatively.

4.8.5 DBST

The district-based support team is an incorporation of professional support services at district level. Their responsibility as specified by the DoE (2005: 23-24) is to assist educational institutions to identify and address barriers to learning and stimulate effective teaching and learning which includes both classroom and organisational support as well as provision of specialised learner and educator support. The question on whether the participants are getting support from the districts

was posed during the interviews. Participant TH said: *“Yes they come to assist, like before we do a task it has to be moderated by the HOD, the moderated task is check by the district and also they bring additional materials to support us, they give support to us teachers and they give workshop, even though challenges are still there”*. Participant TA concurred, saying: *“some time and again a woman comes to see if we are really supporting the learners or not”*.

Provision of supportive material as required by the DoE (2005: 24) is the responsibility of the district, however, participants TA and TB indicated they did not receive the required supportive material they needed, as reflected in the following comment from participant TB: *“They come to check but not providing the materials we need”*. She further stressed: *“you know I wish the district can support more like provide us with the teaching aid like the chart, you know like the different teaching aids, because I’ve realise that like the grade 4’s they need things like touching, seeing, if the district can supply us with those things it will be much easier for us”*. Participants TC and TD appreciated the support they were getting from the district. TD said: *“We do get support from them, just like now we do attend workshop every Tuesday for the whole May”*.

Participant TJ acknowledged the service of the DBST; she acknowledged and valued the support she was getting from them as revealed in this statement: *“There are those who are from department of social development, they come Mondays and Tuesdays they give them the food, then they treat their homework, we say they are the homework teachers, they come, they look at the homework we have given them and they carry on teaching them. And there’re those who are from the department, they used to help us, if am having ten learners they handle half and I take the other half”*. She acknowledged that the intervention is very helpful. However, she indicated that some learners were not improving despite all this support.

The majority of the participants were not satisfied with the DBSTs and complained about the lack of resources/teaching aids which the district was supposed to provide.

4.8.6 Parental support

In Chapter 2 it was indicated that parent/guidance support is important in a child’s education, also that the South Africa School Act 84 of 1996 has sanctioned their participation in their children’s education. It was also noted that educators have the sense of being supported and valued when parents support them and that this refreshes their zeal for problem solving. Parents have a good understanding of their child and can provide information to teachers that can help support the learning needs of those children. However the data collected during the interviews revealed the

nonchalant attitude of most parents regarding their children's education. During the interviews the participants indicated lack of parental support was contributing to challenges they were facing in addressing barriers to learning.

Participant TA said: *"I think parent support, even the worst learners are not getting support from their parent, even when you called the parent to come they don't come, you write letter asking them to come they don't come i even write in the learner book, they don't check the book and don't sign"*. He mentioned that learners get demotivated when they realise their parents are not interested in their academic progress, reflected in his words: *"So the learners can see that their parents are not interested so they also feel like they are just wasting their time"*. Similarly participants TB and TD indicated lack of parental and home guidance. Participant TJ said: *"I will say lack of parent guidance, if a child comes back to school without writing his or her homework which mean there is no one at home to ask have you done your homework, are you doing your homework or what did they give you at school"*.

Participant TE said: *"parent does not help us at all, we use to give them extra work for homework so that the parent can see the lesson for the day and the child can come back tomorrow without writing the homework, you write a letter to the parent telling them their child does not write his or her homework, you will find these letter also inside the book the way we give them and we have realise that learners fails to give these letter to their parents, so we are now writing in their books so that if their parent can read the message, they most sign it, but most of them don't sign which show that they don't check their children books"*. Participant TH indicated that most of the learners lack guidance from home and are given adult responsibilities which invariably hindered their school performance.

Participant TG explained that she usually gave homework to learners that were unable to participate in the expanded opportunity classes due to transportation issues, but she noted that often these learners did not do their homework and they lacked parental supervision. When she was asked whether she tried to contact those parents, she replied by saying: *"I usually write letter to their parent but to my surprise they won't check, it will come back the same"*. Participant TF acknowledged that most of the learning challenges are not related to school, which is why her school tried to involve learners' parents. However she indicated that they received minimal response from parents. She said: *"You call the parents they don't come (she clap her hand) write them letters..., phone them..., some of the phone numbers we have here at school are not theirs, they don't give correct information"*.

Participants' frustration and disappointment are reflected in the comments above regarding unsupportive parents in education matters. Learning is not restricted to the four walls of the school but also the home and community. Educational White Paper 6 (DoE, 2001) recognises that learning is bigger than official schooling and accepts that it occurs in the home and community, and learning can happen within formal and informal settings and structures. Thus, collaboration and cooperation between the teacher and the child's parent or guardian can help foster learning the process by helping teachers with the necessary information to support learners through their choice of instructional practice.

4.9 DISCUSSION OF THE FINDINGS

The data was collected to meet the research aim which sought to investigate the challenges in teaching learners experiencing barriers in mathematics at the intermediate phase level in Tshwane, South Africa. The study findings revealed four themes which were consistent with the findings of the literature review. The themes enabled the researcher to find answers to the research sub questions which was stated at the beginning of the study, namely: What are the educational related issues influencing the challenges in teaching mathematics to learners experiencing barriers? What are the teacher related factors that contribute to challenges in teaching mathematics to learners experiencing barriers? In which ways are learner attributes influencing the challenges in teaching mathematics to learners experiencing barriers? Which strategies are available for teachers to support learners experiencing barriers in mathematics?

The four themes that emerged were: educational issues that influence teaching challenges, teacher related factors that influence challenges; learner attributes that influence teaching challenges, and strategies available for teachers to support learners. Under the themes various categories were derived which enabled the researcher to accomplished the set objectives. This discussions starts with the challenges that arise from issues related to education. Educational systems have gone through various changes as was pointed out earlier, in order to align with the new paradigm shift in teaching toward constructivism, which entails active participation of learners in the teaching and learning process and a pedagogical practice that is centralised on children. However this restructuring requires a lot of adjustment for teachers and comes with challenges. This restructuring involves propagation of new policies that will enhance children learning, although restructuring requires a shift in teachers' pedagogical practice which might not be uncomfortable for them.

4.9.1 Educational related issues

From the data collected it was revealed that language barriers are one of the prime challenges teachers had to face in their pedagogical practice of mathematics. The majority of participants had learners who could not comprehend the medium of instruction used in the class because most of the schools were using English medium at the intermediate phase which is different from the mother tongue used at the foundational phase, so as a result the majority of the learners struggled with language. This affirmed what Webb (2004) revealed in his study that English acts as a hindrance to the development of education in South Africa because the English proficiency of black learners is mostly insufficient for them to receive instruction in the English language. Additionally, the study of Setati, Adler, Reed and Bapoo (cited in Adler and Reed (2002: 73) revealed that mathematics and science teachers are facing double challenges in their classes because while their learners are still trying to learn English language, they are teaching their subject in that particular language. Their study also found that most textual materials used in teaching and learning in South Africa schools are printed in either Afrikaans or English, languages that are of home language for few teachers and learners in the country. Many teachers teach in a school environment that uses English as their official language of instruction but which is not the home language of these teachers and their learners (Adler & Reed, 2002: 73). However, it was indicated in the literature review that the South Africa language policy supports eleven official languages and every child has the right to receive education in any of these official languages in public schools of their choice (Constitution of South Africa, 1996 section 29). Nonetheless as noted by Webb (2004) in Chapter 2, high esteem for English and the negative social sense attributed to Africa language in the society has resulted in a strong preference for English as instructional medium. Moreover most of the participants reported using mother tongue to switch code when teaching but they maintained not much is achieved in the process. The South Africa language policy supports switching of code, although Lemmer and Van Wyk, (2010: 226) assert that English second language learners, whose mother tongue language are insufficiently developed, are not likely to accomplish academically.

It is clear from the findings that the majority of the participants appreciated and acknowledged the strategy of government to improve mathematical skills in the province by means of the GPLMS (Gauteng Primary Language Mathematics Strategy). Most of them indicated that the strategy has helped to improve their teachings and ease their workload with readymade lesson plans and various teaching samples provided to them. This supported what de Clerq (2014: 303) stated regarding GPLMS in Chapter 2, that GPLMS is a well standardised and potent intervention for improving

learners results with good quality supportive learning materials that are well arranged, with lesson plans and the provision of coaching.

Conversely the participants criticise the strategy for not adequately accommodating learners experiencing barriers. They pointed out that the strategy runs at a fast pace, containing loads of work and learners experiencing barriers were unable to cope with the standard. This affirmed what was inferred in Chapter 1 that most learners experience barriers to learning or drop out of school due to lack or failure of the system to accommodate their different ranges of learning needs typically through inappropriate curriculum, assessment, learning resource materials and method of instructional practice (DOE, 2001). Originally GPLMS was fashioned to address underperformance in mathematics and language with the aim of promoting performance in those subjects. Because the government acknowledged in Education White Paper 6 (DOE, 2001) that every child has the potential to learn and are eligible for support, the policy also stated that all children are entitled to receive quality education and support. However this study reveals a situation where the strategy promulgated by the administrator to address learning needs is causing obstruction to learning. This affirms the argument of De Clercq (2014: 315) who states that the conceptual flaw of the strategy is the adoption of a generic approach of 'one size fit all' for improvement of nonperforming primary schools, and teachers were not consulted in relation to decision-making but decisions were directed to them from top, that is from the MEC to teachers of nonperforming schools. This also supports Fullan's (2007) comment that teachers claim that policymakers know nothing regarding what is needed in education neither do they understand the classroom process. Therefore it is necessary to include teachers' input in policies relating to classroom practices because they understand perfectly what is transpiring within the context. De Clercq (2014: 316) recommends skilful support strategy for teachers to efficiently teach the slow learners and those with learning barriers coming from poor socio-economic and multilingual environments.

From the findings, overcrowded classes and lack of resources emerged as challenges. The participants confirmed the essentiality of resource materials/teaching aid at the intermediate phase; they acknowledged that most of their learners relied on concrete substances to learn better. This confirms the stage theory of Piaget in the literature review which argues that the logical reasoning of concrete operational children is still limited to manipulation of physical substances (Woolfolk, 2010). The age range of the concrete operational stage falls within the intermediate phase and according to Piaget children of this stage rely predominantly on concrete manipulative substances for learning. As study by Kennedy (1991) revealed that children who experience concrete material in teaching and learning environment develop better mental images than children with less exposure to it, and these

children have clearer views of the concepts taught. Likewise manipulation of physical substances fosters active involvement in learning. Piaget proposed that learning is mainly constructive in nature and that learners actively construct their own learning (Ozola & Purvins, 2013: 134). The constructivists claim that each time children intermingle with their environments new knowledge is constructed (Bakhurst & Shanker; Smith cited in Shotte, 2013: 155). However, even though there is evidence of the benefit of manipulative resources/teaching aids in facilitating learning, insufficiency and complete absence of teaching resources feature prominently in this study's findings. This confirmed Ormrod's (2014) findings in the literature review that schools in the low income communities are mostly poor quality schools, poorly funded and lack equipment and a maintenance culture.

4.9.2 Teacher related factors that influence challenges

Teacher's skills in identifying learners' weakness and strength feature in the findings, including the training they received. This theme helps to answer one of the sub research questions. The DoE (2008: 1) specified that inclusion is not only applicable to curriculum but also to assessment in the class, and that assessment tasks are to be structured and modified in a manner that will address barriers. The findings revealed various techniques used by teachers to identify the strengths and weaknesses of their learners and the support strategies they are employing to address barriers. In identifying barriers in mathematics all the participants indicated that they used formal and Informal assessment method ranging from exams to classwork-activities, project work, question and answer and so on. However none of them indicated using specific guidelines or SIAS processes, as specified in educational policy on assessment, to diagnose their learners learning needs (DoE 2008). This supported the findings of Mkhuma et al. (2014: 444) that most teachers have challenges in using SIAS and they lack knowledge of various difficulties in learning. Mpya (2007: 105) points out that teachers need training regarding contextual background of barriers to learning, the causes of barriers, particular curriculum to follow, content and materials to use, teaching strategy to employ and ways of averting barriers learners are experiencing. Equally, the DoE (2005) states that, if educators are the chief players in the course of identifying and addressing barriers to learning, they require training regarding barriers to learning and ways of identifying them.

The issue of training came up during the interviews; all the participants confirmed that they had undergone one form of training or another. Most of the teachers acknowledged and valued the training they received before implementing GPLMS and the on-going training they were attending. This supports De Clercq (2014: 304) as reported in Chapter 2 who said that professional

development is a progression of developing teachers' ability and agency aiming to improve teaching and learning and the performance of learners. Carl (2009: 215) emphasises that in-service training plays an important role as it contributes to the competency of teachers and assists them to master the applicable skills. Meanwhile some participants had a contrary opinion regarding the training in that they believed it was not enough.

4.9.3 Learner attributes that influence teaching challenges

Lack of fundamental mathematical concepts from the foundational phase were revealed in the findings, Participants mentioned that most of the learners come from the foundational phase with a deficit in fundamental concepts/skills in mathematics and this situation hampers the instructional practice of mathematics at the intermediate phase because the teachers has to go back and teach what learners were supposed to have acquired from the foundational phase. According to them not only does the process slow down the teaching-learning situation but also frustrates teacher efforts. The participants indicated that these learners struggle with simple computation such as addition, subtraction, multiplication and division. This confirmed Machaba and Mokhele's (2014: 388) findings which revealed that grade 3 learners from underprivileged schools in Tshwane South District area were unable to carryout basic operations in mathematics. They indicated that these learners lacked the ability to execute computations such as additions, subtractions, multiplications and divisions.

Schultz et al. (1989) pointed out in the literature review that preoperational stage children develop skills which enable them to perform higher mathematical operations and they also develop one to one correspondence which helps them learn counting, adding and subtracting. Therefore it can be concluded that children that exhibit difficulty in these areas demonstrate lack of basic concepts from the foundation. Some of the participants also mentioned that the quality of knowledge possessed by professionals teaching at the foundational phase has a relationship to the quality of learners they are producing. This validates Fleich's (cited in Venkat (2012: 107) observation that many current studies indicate that South Africa has challenges in the teaching and learning of mathematics at the primary level. Similarly Vogel (2011: 214) pointed out that some teachers' knowledge of mathematics is inadequate and they have limited conceptual insights. Research by Glennon (1981) showed that generally mathematics teachers only have half of the mathematics knowledge they are teaching children in grade K-6 and special education teachers have even less knowledge of mathematics and instruction. Glennon (1981) states that one cannot adequately teach what one does not understand well.

In addition social/indiscipline problems, lack of learner interest and maths phobia and inability to read and write emerged from the study. It was revealed from the findings that all the aforementioned problems are linked; most of the participants associated the indiscipline and non-performance of their learners with the home background and socio-economic problems plaguing learners' communities. This verified the report of British National Literacy Strategy in which Stannard and Huxford (cited in Lemmer and Van Wyk (2010: 188) indicated that majority of the underperforming children are from poor homes that have poor learning environments from early childhood. Likewise the study by Bennett (cited in Woolfolk, 2010) found that about one-fourth of low-income earners children are dropout from schools. Landsberg et al. (2010: 30) state that poverty is reflected through educational backlogs and deficits in language and communication in South Africa. Engelbrecht et al. (2007: 90) point to the relationship between language and numeracy; they maintain that those learners who exhibit problems in mathematics have trouble with language in terms of reading and writing. In the current study the deficiency of learners' reading and writing skills was evident with the participants confirming this was impeding learning the process. Some participants were of the view that this was accumulated from the foundation phase of learning. Landsberg et al. (2011: 143) state that reading skill is assumed to be a major skill required for learning in this digital society. Absences of this skill especially at the intermediate phase will result in barriers to learning. The participants complained that the learners struggled with word sum due to reading problems, supporting the argument of Vogel (2011: 215) who opines that learners who struggle to read will battle to understand word sums and mathematics constructions, and these learners will perform badly in written mathematics.

4.9.4 Strategies available for teachers to support learners

The findings of this study indicate that participants were definitely providing interventions for learners experiencing barrier in mathematics. Some of the forms of intervention mentioned were provision of extra classes, use of concrete objects, simplifying and reducing workload for learners etc. Nonetheless it can be deduced from the findings that the participants' mode of intervention was generic except for three participants that specified meeting their learners on a face to face basis. Education White Paper 6 (DOE, 2001: 16) acknowledges that all learners vary and have different learning needs. Likewise Landsberg, Kruger and Swart (2011: 75) write that the inclusion policy maintains that learners who experience barriers to learning should participate fully as school community members and should be provided with quality education through effective teaching and given necessary support. The DoE (2008: 15) has specified the need to draw up individual support plans (ISPs) in order to keep track of support administered to learners and their progress.

Nonetheless most of the participants complained about their inability to render individual assistance to learners experiencing barriers due to overcrowded classrooms and the large number of learners experiencing barriers in a class. Educational White Paper 6 (DoE, 2001) states that all children are entitled to quality education and support, teachers are expected to accommodate and provide for a diverse range of learning needs. However the national commission on teaching and America's future in Feiman-Nemser (2001:1013) indicated that policies can only bring improvement to school systems if the school personnel are well equipped with the necessary skills, knowledge and support required.

Active involvement of learners in teaching and learning processes surfaced in the findings from this study, and was claimed to foster understanding of the learners. This endorsed Piaget's and the constructivist's notion of active involvement in learning which focuses the teaching process on the learner as an active constructor of their own knowledge while teachers are just guides in the process, and focuses on the learning of the children not just on delivery of content (Eraslan, 2013: 155).

Findings from this study regarding support from the Institutional level support team (ILST)/school based support team(SBST)/ collaborative teaching, District-Based support (DBST), and parental support was mixed. Regarding support from the ILST/SBST some of the participants' acknowledged the support they received from them, while the majority mentioned not receiving any or inadequate support from their SBST. However the Education White Paper specifically indicated that school should establish school based support team and their functions are to equip and help teachers in managing learning barriers in their classes (DoE, 2001). Likewise Mahlo (2011: 198) recognised that SBST or ILST is a swift and effective method of assistance in identifying concerns related to education that require solutions as they occur. The team members are to design strategy to address the matters by employing tangible steps. However it can be deduced from the findings that most of the schools are not adhering to this inclusive specification outlined by the Department of Education (2001), regarding the institutional level support team. As the findings revealed, collaborative/colleague's help is the only support method readily available in most of the participating schools; there are no integrated, structured SBSTs, and the one in existence was not functioning optimally. This verified the findings of Mahlo (2011: 198) who identified that SBSTs in most schools are non-functional. Similarly Nel's (2014) finding revealed that the ILSTs are not functional as they are supposed to be, and substantial workloads weigh teachers down which diverts them from giving attention to individual learners.

Similarly, the findings revealed that District-Based support (DBST) is not adequate in most schools as the participants indicated lack of support in terms of resource materials and professional help. The

responsibility of the District-Based support team (DBST) as specified by the DoE (2005: 23-24) are to assist educational institutions to identify and address barriers to learning and stimulate effective teaching and learning which includes both classroom and organisational support, as well as provision of specialised learner and educator support and provision of supportive material for teaching.

Parental support in education facilitates the teaching-learning situation. However, the findings of this study revealed a lack of support from parents as most of the participants indicated their frustration at not getting support from most of the parents. Lemmer and Van Wyk (2010: 200) indicate that when parents value and support teachers their zeal for problem solving is refreshed and children success lasts for lifetime when their family and school collaborate to support them. A study by Luxomo and Motala (2012: 148) found that parents perceive teachers as having overall power over their children's achievement so because of this they were disinclined to contribute their quota. The participants in the current study noted that most of their learners don't do their homework especially those experiencing barriers and they explained that most parents are not reachable even with all efforts to contact them regarding their child's issues. This affirmed what Luxomo and Motala (2012: 148) pointed toward in their study indicating that parental involvement in SGBs is disturbingly low. Mpya (2007: 79) pointed out the importance of parents' provision of relevant information regarding their children which can aid teachers in fostering support for learners experiencing barrier. Likewise Mahlo (2011: 192) suggested that parents should be involved in the process of learner screening; she indicates that parents' participation in the screening, identification, assessment, support (SIAS) will give them background knowledge of their child's situation.

4.10 CONCLUDING REMARKS

This study sought to investigate the challenges in teaching learners experiencing barriers in mathematics at the intermediate phase level Tshwane; South Africa. Analysis of the data discussed in this chapter revealed that there are various challenging factors facing teachers' when teaching learners experiencing barriers in mathematics. The data was gathered through qualitative interviews with ten mathematics teachers at the intermediate phase of learning.

Even though it was revealed that teachers were supporting learners experiencing barriers in mathematics in their own ways, there were challenging factors impeding the process which caused frustration and disappointment because they were not achieving the expected result they wished for. The teachers shared similar views regarding to the challenges they experienced. They pointed to factors such as lack of parental support, lack of support from SBSTs and DBSTs, overcrowded

classrooms, social problems and undisciplined behaviour of learners, language barriers, issues related to policy of education, lack of resources and learners inability to read and write.

The challenges in teaching learners experiencing barriers in mathematics at the intermediate phase in Tshwane South District were fully discussed in this chapter. It was realised that the findings of the study were consistent through the data gathered from the ten participants. Evidence from the findings indicates the challenges teachers experienced will need to be addressed for teachers to be productive. The closing chapter focuses on recommendations, summary and conclusions.

CHAPTER 5 : CONCLUSIONS, LIMITATIONS, RECOMMENDATIONS AND SUMMARY OF THE STUDY

5.1 INTRODUCTION

The previous chapter presented the data which was analysed, and the findings arising therefrom. The likely factors that could have given rise to the results were discussed in the light of material from Chapter 1 and the reviewed literature in Chapter 2. This chapter concentrate on drawing conclusions from the findings, making recommendations and the study summary.

This study employed a qualitative approach to investigate the challenges experienced by teachers teaching learners experiencing barriers in mathematics in intermediate phase: Tshwane South District. Qualitative interviews were used in order to answer the research question. The sub research questions were as follows:

- What are the educational related issues influencing the challenges in teaching mathematics to learners experiencing barriers?
- What are the teacher related factors that contribute to challenges in teaching mathematics to learners experiencing barriers?
- In which ways are learner attributes influencing the challenges in teaching mathematics to learners experiencing barriers?
- Which strategies are available for teachers to support learners experiencing barriers in mathematics?

5.2 SUMMARY OF THE EMPIRICAL RESEARCH FINDINGS

Challenges experienced in teaching learners experiencing barriers in mathematics are the central idea of this study. Challenging situations impede successful teaching and learning. In the face of these challenges teachers are expected to judiciously carry out their responsibility of educating learners and ensuring they all receive quality education. The inclusion policy further mandates teachers to include every individual learner in the learning process and cater for their individual learning needs, which precipitates many challenges.

From the findings it was revealed that mathematics teachers are indeed experiencing challenges when teaching learners experiencing barriers in mathematics. Although they are using support/interventions to deal with barriers to learning, it is clear that many challenging factors are

wrestling with their pedagogical practice which causes frustrations and obstructs their teaching practice. The main purpose of the study was to investigate the challenges experienced by teachers teaching learners experiencing barriers in mathematics, focusing on the intermediate grades in Tshwane South District; South Africa. Chapter 1 presented an introduction to and the general background of the study. Related literature was reviewed in Chapter 2 and the research methods used for the study were discussed in Chapter 3. Chapter 4 presented and analysed the data. From the outcome of the literature review and the interviews four themes were identified and discussed in Chapter 4.

The data analysis began with the participants' profiles (see Tables 4.1 and 4.2). The profiles indicate that most of the participants had nothing less than a diploma or certificate, with the majority having two qualifications in education. Their qualifications are a good indication that they meet the requirement to teach at the intermediate phase level. From the overall pedigree of qualifications presented in the findings it can be assumed that teachers' qualification might not be the possible root for the challenges they experienced in their pedagogical practices. The second profile table (see Table 4.2) displays an impressive volume of teaching experience from the majority of the participants which ranges from 0 - 37 years, with an age range of 25-60 indicating they are mature and experienced. Coupled with their qualification profile relevant to the teaching profession, one can conclude that they are well suited to teach at the intermediate level.

The findings clearly indicate various factors which predispose teachers to challenges when teaching learners experiencing barriers in mathematics. There is an indication from the data obtained that teachers experienced common challenges which are thwarting their teaching-learning situation. These factors hampered productive efforts by the teachers which invariably resulted in frustration and despair. Those factors ranged from challenges regarding educational related issues, teacher related factors, learner' attributes and strategies available for teachers to support learners experiencing barriers.

Evidence from the findings indicates that the participants were definitely making an effort to address mathematical problems their learners encountered in the classroom; from the interviews their readiness and dedication in alleviating barriers in mathematics was clear. The participants were in their own diverse ways using supportive interventions to address mathematical barriers and support learners experiencing barriers in mathematics. However, their lack of specification in identifying barrier in learning inhibited their ability to appropriately render suitable support as needed by learners.

Various challenging factors inhibiting the pedagogical practice of the participants mathematics were enumerated during the interviews, ranging from lack of resource materials/teaching aids, the weak background of learners in mathematical concepts from the foundational phase, language barriers, reading and writing problems, socio-economic problems, overcrowded classes, the nonchalant attitude of learners toward mathematics, undisciplined behaviour of learners and lack of adequate support for teachers from parents, SBST, and DBST. All these limit teachers' capacity when administering support strategies and to contributed greatly to curbing the attainment of their desired goal of eradicating barriers in mathematics.

Some of the findings were relevant to the provincial government's efforts to improve mathematics and language through the introduction of the Gauteng Primary Language and Mathematics strategy (GPLMS). The strategy was put in place to address the persistent issues arising from mathematics and language learning, which majority of participants attested to during the interviews. Most of the participants agreed that the strategy was good and that it lessened their heavy load of work due to the ready-made lesson plans and the variety of well explained teaching examples, which they admitted helped to improve their instructional practice. However they all indicated having problems with the strategy increasing the workload for learners, the inconsistency/flow of sequence in terms of topic, and the fast pace at which the strategy was running which they mentioned was not accommodative for learners especially for those experiencing barriers.

The challenges experienced by teachers teaching learners experiencing barriers in mathematics in the intermediate phase in Tshwane South district, Gauteng province were discussed at length. There were common findings in the data gathered from the participants interviewed. Ten intermediate mathematics teachers were interviewed. The interview process enabled them to express their challenges when teaching learners experiencing barriers in mathematics. Although some teachers revealed some progress in addressing such barriers they affirmed this to be slow due to various challenging factors.

5.3 SUMMARY OF THE LITERATURE REVIEW FINDINGS

The literature reviewed in Chapter 2 revealed various facets of challenges teachers' experience when teaching learners experiencing barriers in mathematics across the globe. The central focus of education is the learners and actualising the aim of educating them rests predominantly on teachers. The inclusion policy increased the responsibility by instructing them to meet the diverse needs of individual learners in their classes not excluding any but guarantee everyone standard education.

The demand placed on teachers to address all the challenges they witness in their pedagogical practice needs appropriate attention and redress.

Evidence from the relevant literature spells out numerous challenges teachers encounter during instructional practice which can impede successful teaching and learning process. The findings highlighted all the possible challenges experienced by teachers, as summarised below.

Many challenges result from changes in pedagogical practice and subject content. This shift is in line with the constructivist notion and inclusivity which centralises learning on children and demand that teaching should take account of differences in learners' abilities, their style of learning, needs and interests (c.f.2.3.1). However, as indicated, teachers have difficulty in meeting these demands due to their background which is rooted in the age-old traditional teaching method and the introduction of new content which differs from what they learnt in school.

Another finding that features clearly in the review was the challenge posed by educational reforms, new policy and frequent revision of educational curricula which usually necessitate change particularly in pedagogical practice. Most changes are targeted at improving learners' performance and teachers' pedagogical practice. However, students are entering tertiary institutions with a deficit in mathematics and science knowledge (c.f.2.3.2). Likewise, substantial's proof from recent studies indicate that teaching and learning of mathematics in South Africa has severe problems (c.f.1.4). Irrespective of the necessity of these changes in most cases they come along with challenges which make it difficult for recipients to adopt and welcome it. In the review it was indicated that teachers are facing challenges related to educational reform such as limited professional development, absence of resource, and because policy makers exclude them from decisions related to classroom factors (c.f.2.3.2).

Regarding interventions to promote learners performance it was gathered that departments of education and educationists have developed numerous interventions to promote teaching and learning quality, but earlier interventions were hardly well taken which hindered them from producing substantial progress in school performance. Likewise the recent strategy of GPLMS looked promising with its multiple branched support strategy composed of recommended lesson plans facilitated by coaches with numerous relationship support meetings, but it was revealed the strategy has certain flaws such as decisions from top-down without properly consulting the schools, districts and unions; postulation that teachers need to train for 'better knowledge-in-practice' which the lesson plans and coaches are promoting, and; adoption of a generic 'one size fits all' approach for improvement of nonperforming primary schools (c.f.2.3.2.3). However research has proven that the

success of any educational reform efforts rest predominantly on teachers (c.f.2.3.2), and it was indicated that policies can only bring improvement to school systems if the school personnel are well equipped with the necessary skills, knowledge and support required (c.f.2.3.2.1).

It was pointed out that language is crucial in teaching and learning situations; however, it continues to present challenges. The literature review revealed that instructional medium presents a challenge during pedagogical practice in a situation where the primary language of the learners and teachers is not the official language of instruction. The literature review indicated that a high preference for English results in adaptation of English as the medium in most schools. It was indicated that switching of codes is permitted during instructional practice which allows indigenous language to be used. However the literature showed that the majority of the teachers in remote parts are not competent to instruct in English or first additional language (FAL) and code switch needs to be more than mere translation. Not just the word needs to change but it's meaning and the manner in which it is used. There is a huge difference between African languages and English so the idea of changing from one language to another does not appear useful, unless the meaning can remain the same (c.f.2.3.3).

Inability to adequately identify the barriers that obstruct mathematics learning was indicated in the literature. This challenge is a major obstruction to the delivery of appropriate support required to address the learners needs. It was noted that most teachers lack knowledge of various difficulties in learning coupled with lack of knowledge in using the Screening, Identification, Assessment and Support (SIAS) tool which make it hard for them to handle diversity in their various classes (c.f.2.4.1).

Inadequate competency of elementary school teachers was revealed in the literature which resulted from the pre-service and in-service training programme of teachers. It was acknowledged that pre-service and in-service programmes are facing multidimensional challenges. Inadequate knowledge of subject content contributes greatly to challenges when addressing barriers in mathematical learning, as does low quality pre-service and in-service training, anxiety toward mathematics which springs from an authoritarian style, lack of mathematics mastery and over dependence on rote calculation and memorisation (c.f.2.4.3).

that the literature review also found that barriers learners experience also contribute to teaching challenges. These barriers are categorised into intrinsic and extrinsic barriers and these pose a challenge to successful teaching and learning of mathematics (c.f.2.5.1).

The challenge of supporting learners experiencing barriers especially in term of giving developing individual support plans was indicated in the literature. However the Education White Paper 6 (DOE,

2001) recognises that a wide range of learning needs occur among the learner populace at any point in time, and learners may fail to learn successfully or be excluded from learning system in a situation where these needs are not met. Various factors that hinder teachers' ability to support learners were highlighted as follows: lack of resource materials, inadequate professional development, and teachers feelings of incompetence (c.f.2.4 & 2.6).

Support that is available for teachers to improve pedagogy practice and mathematical performance was identified as being insufficient in the literature. UNESCO (2003) acknowledged the importance of giving support to educators which is an important aspect in developing a more inclusive centre for learning. Similarly, the Education White Paper 6 (Doe, 2001: 17) pointed out that an inclusive system is about giving support to all learners, educators and the whole system in order to meet the full capacity of learning needs with emphasis on development of good teaching strategies that will be beneficial to all learners. Support must stem from national, province, district, school to the classroom. However, it was revealed that this support is not functioning as specified in the policy (c.f.2.6.3). Equally the review indicates lack of parental support for both teachers and learners, irrespective of the advantage of learner achievement and school effectiveness when parents participate in their child's education. Parents' nonchalant attitude toward their children's academic progress was revealed and it was also revealed that most parents place the sovereign responsibility of their children's success on the teachers and they are unwilling to do their part (c.f.2.6.3.3).

It is worth mentioning that most of the challenges experienced by teachers which was revealed in the literature are consistent with and the challenging factors impeding the pedagogical practice of the participants in the current research study, including such factors as language barriers, challenges emanating from government policy, lack of parental support, learners lacking firm background in mathematics, lack of adequate support from SBSTs and DBSTs, lack of resource materials and challenges in identifying and supporting learners experiencing barriers.

5.4 RECOMMENDATIONS

The recommendations of the study are based on the research findings. The following sections offer a short summary of the literature review and the empirical research investigated. It is worth pointing out that the interview questions were shaped in accordance with the literature that was reviewed and which was conducted in order to enable researcher to articulate the research sub questions stated at the beginning of the study (c.f.1.5). The themes generated from the empirical research permitted the researcher to meet the study objectives. The next section offers a short summary of the answers to the sub research questions and recommendations which were made.

5.4.1 The findings on educational related issues

Substantial evidence from both the literature review and the empirical study revealed the challenges teachers experienced as a result of educational policy. It was indicated that planning and structure of education sometimes comes with challenges; educational reforms often demand change in pedagogical practice, and acquisition of more skills (c.f.2.3.1). However in a situation where teachers lack resources to usher in the new innovation and lack adequate skills to implement it, they will feel intimidated by the change phenomenon (c.f.2.3.2). As a result of how governmental policy is strategised it may sometimes obstruct its main purpose of improving teacher practice and learner performance as was seen in the case of language policy and GPLMS.

5.4.1.1 Language barriers

Based on findings from the literature and empirical investigation it was revealed that language policy is posing a challenge. It was recognised that multi-linguism presents a serious complication in educational provision in South Africa. These challenges are revealed in relation to the medium of teaching and learning (LOLT), the transition and change of medium from mother tongue to English and code switching. The literature revealed that most teachers are faced with several challenges when instructing English Second or Other Language (ESOL) learners and they likewise faced double challenges in class because while their learners are still learning the English language, they are teaching their subject in this language coupled with textual materials which come in either Afrikaans or English, and these two most common language of instruction are not the primary language of both teachers and learners (c.f.2.3.3). The participants complained about language problems; they indicated that most learners struggle to comprehend the medium of instruction. Although teachers are encouraged to switch code during instruction, most of the participants revealed that the process is not yielding desired outcomes (c.f.4.5.2). This confirmed the Lemmer and Van Wyk (2010: 226) who noted that English second language learners whose mother tongue language is insufficiently developed are not likely to accomplish academically (c.f.2.5.1.1). In consideration of the above statement it is therefore recommended that:

- Teaching and learning of language at the foundational phase should concentrate on developing learners in their home language by adhering to established patterns of language learning. This can be achieved if language experts are employed to teach language at the foundation phase.
- Inculcation of English at the foundation phase. Young children are flexible and they have the potential of learning two languages concurrently.

In addition to language classes, other subject teachers can assist in building learners language structure through emphasis on the correct use of language.

5.4.1.2 Gauteng Primary Language and Mathematics Strategy (GPLMS)

Evidence from both literature and the empirical study indicates the benefits and challenges that accompany governmental strategy in terms of the GPLMS. The strategy is commended for serving as an intervention for schools that are underperforming due to its multiple branched support strategy composed of recommended lesson plans facilitated by coaches with numerous relationship support meetings. It was also recognised that with the quality of supportive learning materials that were well arranged and the lesson plans and provision of coaching, the strategy appears to be a well formed and well calibrated intervention for improving the results of learners (c.f.2.3.2.3). Similarly most of the participants agreed that the GPLMS helped to improve their teaching practice and ease their workload with ready-made lesson plans and various teaching samples provided for them (c.f.4.5.3).

At the same time, the strategy was noted for its flaws, which are: top-down decisions made from the MEC to teachers, the postulation that teachers need to train for ‘better knowledge-in-practice’, and the adoption of a generic approach in terms of ‘one size fits all’ for improvement of nonperforming primary schools. It was also noted that autonomy of provincial departments is severely limited because widespread policies are set by the national government. The Gauteng Department of Education may develop innovative means to a shared goal but they are basically implementing agencies which must work in the domain of policies set by the national department in Pretoria, not in the provincial headquarters in Johannesburg (c.f.2.3.2.3). In the same vein, the participants indicated that GPLMS did not accommodate learners especially those experiencing barriers because of the amount of work for learners, the pace at which it was running with limited time slots, and the way contents were sequenced in the strategy. (c.f.4.5.3). The fact that the participants attested to the positive side of GPLMS is a good sign. In the light of the above statements the following recommendation may be made:

- Given the fact that most of the participants testified to the benefit they derived from GPLMS, instead of the discontinuation of the strategy, the strategy should be reviewed to make provision for the slow learners and those experiencing barriers. Adequate time should be allocated for each topic which will enable teachers to have sufficient time to explain and assist those needing assistance. The workload at a given period should be spread apart to give room for learners experiencing barriers, and should be structured to consider individual learning pace. Regarding topics, it should be planned to feature more than one for example.

When dealing with a certain aspect for example money, each and every aspect should feature for at least a week for learners to have a grounded understanding.

5.4.1.3 Overcrowded

According to the research findings some classes are overcrowded and flooded with learners experiencing barriers and this situation hindered teachers from assisting individual learners especially the learners experiencing barriers. Some participants noted having more than 50 learners in a class while others indicated that more than half of the class were experiencing barriers to learning.

Recommendations:

- Schools should ensure they have in each of their classes' limited numbers of learners which are manageable for teachers to handle, for example 30-35 learners in a class.
- In situation whereby a class contains a large number of learners experiencing barriers, assistance teacher may be recruited. In case of insufficient funds to recruit additional staff, parent or community members should be called upon to volunteer and assist in the classroom.

5.4.1.4 Resources/teaching aids

Teaching resources/aids are non-negotiable at the intermediate phase of education as most of the learners in this phase rely on concrete manipulative material to foster their learning. Piaget's theory proposes that concrete operational children learn through the means of concrete substances that can be felt, touched and manipulated. He indicated that some children in the formal operation stage are still tied to the concrete level. The two stages are where the intermediate phase learners are located according to the age range specified in the stage theory of Piaget (c.f.2.2.2.2). There is an indication from the research findings that teaching resources/aids continue to pose a challenge to teaching and learning of mathematics: participants complained of the lack and inadequate supply of teaching aids (c.f.4.5.5). It was indicated in the literature that provision and allocations of resources in the apartheid era was exceedingly uneven and differentiated and the democratic government intended to close the gap by ensuring redress in unequal access to education with equity in resource allocation, with the districts being responsible for supply the learning support materials (c.f.2.6.3.2). However it was indicated from both literature and the empirical study that inadequate supply of resource materials was among the prime challenges facing teachers in their pedagogical practice.

Recommendations:

- The SBSTs should ensure adequate provision of resource materials to schools by the district through making necessary enquiries and follow up so that appropriate learning materials and teacher resources are made available to support the teachers and the learners.
- Likewise the SBSTs should solicit for funds from parents and community members to support the school in providing resource materials.

5.4.2 Findings on teachers related factors that contribute to challenges

Clear evidence from the research findings indicated inability of teachers to actually identify learning barriers in mathematics. This was revealed when they all mentioned the generic mode of identifying their learners strength and weakness, however inclusive education policy acknowledge individual different which include learning rate, style and interest and recommend support on these basis. Equally the constructivist idea was based on the notion of accounting for differences in learner abilities, style of learning, needs and interest.

5.4.2.1 Identification of strength and weakness

The research findings indicate that teacher's ways of identifying learners' strength and weakness were through the former class test and examination, and through various informer activities such as, class project, workbook, homework and other class activities, without precision on how these assessment techniques accurately educate them on their learners' situation. However in the policy document of inclusion there is a specific guideline (SIAS) to follow which will accurately provide correct and specific areas learners are struggling with and likewise guide teachers on the relevant support to give.

Recommendation:

- It is therefore recommend that proper training is given to teachers on how to apply SIAS guideline in identifying learners experiencing barriers in mathematics, these can be achieve through school based workshops, the SBST could be train by the district official, which in turn can train and continue to assist teachers in their classroom with issue relating to identification of learners experiencing barriers.

5.4.2.2 Issues related to training

Training issues were evident in the finding. While some acknowledged the training they went through others claimed it was not adequate.

Recommendation:

- Continuous training is recommended for teachers' professional development. School base workshops and training will be ideal and might be easy to organise, convenient and cost effective.

5.4.3 Findings on learner attribute that influence challenges in teaching mathematics

This study found that there are several challenges that emanated from learners themselves, each of which were described in Chapter 4. The challenges that resulted from learners attributes which influenced the teaching and learning of mathematics as identified in this study were addressed under the headings which follow.

5.4.3.1 Lack of fundamental math concepts from the foundational phase

Evidence from the study revealed that learners have weak knowledge of mathematical concepts from the foundational phase, which is consistent with the evidence revealed by Machaba and Mokhele (2014: 388) in their study that grade 3 learners from underprivileged schools in Tshwane South District area are unable to carry out basic operations in mathematics; they indicated that these learners lack the ability to execute computations such as addition, subtraction, multiplication and division. The participants indicated that most of their learners struggled with the same simple computations. They also stated that learners find units, tens and hundreds difficult (4.7.2). Findings from the literature review stated that in arithmetic operation learners' battle to shift from concrete technique to abstract technique in counting relating carryover/borrowing (c.f.2.4.2). Piaget proposed that preoperational stage children have the skills which enable them to perform higher mathematical operations and they also develop one to one correspondence which helps them learn counting, adding and subtracting (2.2.2.1). A situation where intermediate grade learners battles with basic operations in mathematics is an indication of a weak foundational background in mathematics, because according to the Piaget stages, intermediate phase belongs to concrete and formal operation and at this stage the learner is assumed to have already acquired the necessary mathematics concepts mentioned above. Therefore the following recommendations are made:

- To ensure a firm background in mathematical concepts, specialists in mathematics should be employed to teach numeracy at the foundation phase.
- Likewise it is recommended that professionals should specialise in early childhood development (ECD) so they will be able to teach in accordance to children age and development and take their learners' contextual background into consideration.
- At the beginning of intermediate phase which is grade 4, learners should be assessed to identify their prior knowledge to determine their strengths and weaknesses in the subject and the assessment should be used together with the learner portfolio from the foundational phase to enable teachers to accurately capture the learners needs and know where they need assistance.

5.4.3.2 Problems with reading and writing

Reading and writing are crucial skills for learning. However, the research findings revealed a lack of adequate reading and writing ability among learners.

Recommendation:

- To decrease the number of learners struggling to read and write, all subject teachers including mathematics teachers should endeavour to help all their learners read so to improve their reading ability and they should try to emphasis more on correct spellings to reduced wrong spellings.

5.4.3.3 Socio and disciplinary problem

The research findings indicate that undisciplined behaviour and social problems of the learners impede the teaching process as the participants revealed that some learners from dysfunctional backgrounds disturb the lesson sessions and distract other learners from concentrating in the class (c.f.4.7.4). It is therefore recommended that:

- Appropriate disciplinary measure should be put in place to constructively address the undisciplined behaviour of learners. The social department through the social worker can be called upon to collaborate with teachers in this regard.
- In the case of social issues a social workers, psychologist or therapist should be based in every school and work together with teachers to address the situation. Likewise parents of the learner should be called since the issue stems from home to give them background

information and to work cooperatively with the school. This will help in tackling the situation.

5.4.3.4 Lack of learner interest and maths phobia

Learner lack of interest in mathematics was revealed in the study. In Chapter 1 lack of interest in mathematics was related to the teaching mode and structure of the subject. Teaching and learning scenarios that engage learners actively would spur their interest. The constructivists in the literature review verified that children learn actively, likewise Piaget indicated that children construct their own understanding of mathematics. It is not set up like a rock neither is it obtained as a gift from others. In a situation where mathematics learning excludes learners from active participation the class will be bored. The literature indicated that teaching of mathematics should be linked to a child's visual or perceptual experience because these will create a firm background for mathematics learning. Equally it was acknowledged that children's construction of knowledge cannot be separated from external representation. In consideration of the above statement it is therefore recommended:

- When planning any mathematics activity teachers should consider using teaching methods that allow active involvement of the learners and always endeavour to relate the concepts to everyday affairs using the learners' immediate context for illustration to encourage participation and foster interest.

5.4.4 Findings on strategies available for teachers to support learners experiencing barriers in mathematics

The findings indicated that teachers lacked appropriate and specified skills to provide support to learners experiencing barriers in mathematics. Their lack of specification in the identification of learners' strength and weakness plus the generic approach of supporting learners that experience barriers is an indication of their incompetence.

Support is inevitable in inclusive education setting; it is the major feature in inclusivity which can enable both teachers and learners to maximise their potential. However indications from the literature revealed lack of support for teachers; likewise, most of the participants interviewed shared similar sentiments, confirming that lack of support and supportive resources were among prime factors inhibiting learners' performance and slowing down the process of addressing barriers in mathematics. Inclusion policy specified the establishment of SBSTs to support teachers especially with issues related to identification and support of learners in the classroom. Similarly DBSTs are

supposed to equip and aid teachers with supportive learning materials. On the contrary, it was gathered from the research findings that most schools fall short in this regard.

5.4.4.1 Intervention programme

From the research findings it was evidence that a generic mode of 'one size fits all' was used to provide support for learners experiencing barriers, and that participants using face to face interventions were not adhering to SIAS specification, neither did they specify the actual support they are gave learners.

Recommendation:

- When supporting learners experiencing barriers in mathematics it is necessary for teachers to have accurate understanding regarding the type of barriers and how these are affecting the learners. For this reason training of teachers on how to identify various mathematical barriers and which support strategies can be used to address particular barriers is recommended. It is also recommended that teachers should be discouraged from using the generic approach of 'one size fits all' when giving support to learners. Emphasis should be more on an individualised approach and they should be trained on how to implement ISP using the SIAS guideline.

5.4.4.2 Active involvement of learners

Piaget believes that learners construct their own knowledge. They do not merely receive it from their teacher; knowledge construction is based on learners' own experiences (Ozola & Purvins, 2013: 134). Equally the constructivist approach is centred on teaching which focuses on learners as the active constructors of their own knowledge while the teachers guides them in the process (BOE cited in Eraslan, 2013: 155). The research findings indicated active involvement of learners in teaching processes foster learning in term of knowledge acquisition and retention. Based on these it is therefore recommended that:

- Teachers should encourage an atmosphere that engages learners' active participation in the teaching and learning situation. This could be done if they employ activities that will encourage and demand active involvement of learners in the teaching process.

5.4.4.3 SBTS/ collaborative teaching

From the study findings it was clear that most schools' SBSTs were not functional while some were not adhering to the standard laid down in the policy regarding formation and function of SBSTs.

Recommendations:

- The school heads, the principal and HOD including SGB should ensure that SBST is established and functional, adhering to the policy document.
- Strict monitoring of the SBST is recommended, the first monitoring could start within the school through the SGB members by setting up a monitoring team to ensure the SBST comply and execute their role accurately, likewise the district should monitor every activities of the SBST to ensure learner experiencing barrier are well supported.

5.4.4.4 DBST

The DBST is responsible for assisting educational institutions to identify and address barriers to learning and stimulate effective teaching and learning which includes both classroom and organisational support, provision of specialised learner and educator support and supportive teaching materials. Although the literature specifically outlined the role and responsibility of the district-based support team (DBST), indications from the research findings were a lack of support for teachers from the DSBT.

Recommendation:

- It is recommended that monitoring teams be set up to ensure that DBST comply and effectively carry out their duties.

5.4.4.5 Parental support

The finding from the study confirms that classroom teachers are unable to cope with the situation in the classes due to lack of parental intervention. Findings from the literature and empirical research revealed teachers frustration and despair resulting from lack of parental support. There is an indication that when parents value and support teachers their zeal for problem solving is refreshed, likewise children's success lasts for a lifetime when their family and school collaborate to support them. However the study revealed low participation of parents; their nonchalant attitude toward their children's education invariably leads to learner demotivation and lack of interest in academic matters. Addressing barriers in learning is a collective responsibility and collaboration of parents

with school personnel will help in achieving a better result. In recognition of the above statement the following are therefore recommended:

- The importance and benefit of parent participation in their children's education should be spelled out to parents/guardians during registration of the child. These will create awareness of what their child stands to gain when parents participate and collaborate with the school.
- Since parents have accurate knowledge of their child, it is recommended that they be included in the process of intervention. This will enable the school to get all the information needed from the parent and likewise parents will know exactly what further help to give the child at home.

5.4.5 RECOMMENDATIONS FOR FURTHER RESEARCH

It is vividly clear from the study that mathematics teachers experienced challenges when teaching learners experiencing challenges in mathematics and this had an unfavourable impact on their pedagogy practice. It was indicated that the aforementioned challenging factors contributed greatly to impediment of teachers' performance. Since it was noted in the study that most innovations to improve teaching and the performance of learners are themselves posing a challenge, this necessitates further research. Further research could concentrate on the following:

- The role and responsibility of stakeholders (teachers, SBST, DBST, and parents/guidance) when addressing barriers in mathematics.
- The effectiveness of SIAS guidelines in addressing barriers to learning mathematics.
- Training on implementation, monitoring and evaluation of ISP for intervention.
- The benefit of collaborative support and teamwork when addressing barriers to learning.

5.5 LIMITATIONS OF THE STUDY

The following limitations were anticipated and given consideration to in the research study.

- Gauteng province has 15 districts and the district has several educational circuits. The study was carried out in one educational circuit in Tshwane South District which limited the researcher from investigating and exploring information from other circuits and districts.
- The research focus was on schools using GPLMS strategy and only one circuit in the district was chosen for the study. The findings of the study might raise concern among other schools

in the district, especially schools that share the view that GPLMS is not helpful to teachers, schools with practical SBSTs, and schools which are getting adequate support from DSBTs and parents. Likewise the well-resourced schools where teachers are well skilled and equipped to address barriers in mathematics.

- The interview method was used to gather data with the intent of getting thick-rich data, therefore the researcher depended on participants for information. Though the participants consented to the study, it cannot be guarantee that they were unbiased when sharing their experiences.
- There are no assurances that participants did not provide fabricated information when responding to inconvenient questions.

5.6 CONCLUSION

Teachers assume a major role in education; their responsibility to make learning happen for learners in the educational domain is crucial. However the central focus of education is mainly on the learners and the educational system is intended to ensure the quality standard of education for all learners, not excluding any child their rightful access to education irrespective of their ability or disability because this is their legitimate human right. The inclusive policy further expand this by maintaining that learners who experience barriers to learning should participate fully as school community members and should be provided with quality education through effective teaching and be provided with the necessary support (Landsberg, Kruger & Swart, 2011: 75).

From the constructivists' standpoint, education/learning should be based on an approach which accounts for differences in the abilities of learner, their style of learning, needs and interests. This approach centres teaching on learners as the active constructors of their own knowledge and teachers as guides in the process. The focus is on students' learning not on delivery of contents. Piaget advocates constructive learning; he believed that children learn better and claim ownership of what is learnt through their active involvement in the learning process. The new pedagogy shift is in line with the constructivist notion of learning, and inclusivity is premised on the view that children have the potency to learn and all they need is support. The education system, structure and method should be set up to meet the needs of all learners equally. The attitude, behaviour, teaching methods, curriculum and teaching environments need to change to meet the needs of all learners.

Teachers have the primary responsibility of achieving the above tasks. The Education White Paper 6 (DOE, 2001) states that classroom educators are the prime resource for realizing the goal of an inclusive education and training system. However in the face of numerous challenging factors and

wrestling with pedagogical practice, actualizing the desire goal of including all and supporting every individual learner will be impossible.

The focus of this study was to investigate the challenges teachers experienced when teaching learners experiencing barriers in mathematics in intermediate phase in Tshwane South District, Gauteng province. The study revealed various challenging factors that hindered teachers' success from effectively addressing barriers in mathematics.

This study found that if teachers are given the necessary training to identify and support learners experiencing barriers, are provided with resource materials, and get the necessary support from SBST, DBST and parents. They can excellently support learners and address the learning barriers in mathematics. Therefore this study contributes to improvement of teacher practice and learner performance.

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APPENDICES

Appendix A Request for permission to conduct research at Gauteng Department of Education

Appendix B GDE Research approval letter

Appendix C Letter to the principal

Appendix D Letter requesting adult to participate in an interview

Appendix E Consent form

Appendix F Interview schedule

Appendix G Example of interview with the teacher

Appendix H Editing certificate

Appendix A. Request for permission to conduct research at Gauteng Department of Education

704, Prezin Park, 282

Johan Heyn, street,

Gezina, Pretoria.

0084

05 March 2015

Mrs. Dianne Buntling

Room 509, 111 Commissioner Street,

Johannesburg.

Gauteng Department of Education

0118436503, Dianne.buntling@gauteng.gov.za

Deputy Chief Education Specialist

Dear Madam

Title: Challenges experienced by teachers teaching learners experiencing barriers in mathematics in intermediate phase: Tshwane South District

I Daniyan Olatope Oladunni am doing research with Andile A Ndikana, a senior lecturer in the Department of Inclusive Education towards a M.ED at the University of South Africa. We are inviting you to participate in a study entitled Challenges experienced by teachers teaching learners experiencing barriers in mathematics in intermediate phase: Tshwane South District.

The aim of the study is to explore and understand the challenges experienced by teachers teaching learners experiencing barriers in mathematics in intermediate phase in the Tshwane South District. Your institutions have been selected because they are implementing the GPLMS strategy.

The study will entail interview session of about 45-60 minutes with educators teaching mathematics at the intermediate phase of primary school. The benefits of this study are to contribute to the

improvement of pedagogy practice of teachers and to proffer possible recommendation that will help teachers handle learners facing barriers in mathematics learning. There are no potential risks that are foreseen in this study. The feedback of the study will be communicated to the Gauteng Department of Education, and to all the participants that take part in the study.

Furthermore, I would like to assure that the process of data collection will not interfere with the regular school routine because the interview will be carry out during the educators non-contact time.

Yours sincerely

Signature

Daniyan Olatope Oladunni (Ms)

Position: Student

Appendix C. LETTER TO THE PRINCIPAL

704, Prezin Park,282

Johan Heyn Street,

Gezina, Pretoria.

0084

05 March 2015

The Principal

Dear Sir/Madam

PERMISSION TO CONDUCT INTERVIEW

I am currently a register student at the University of South Africa (UNISA) working on my M.ED research work (with specialisation in Inclusive Education). I am working under the supervision of A A Ndikana in the department of Inclusive Education.

My dissertation title is 'Challenges experienced by teachers teaching learners experiencing barriers in mathematics in intermediate phase: Tshwane South District.'

I will like to request for your permission to conduct an interview to the intermediate phase educators who teach mathematics at your school. The interview is schedule to last for about 45- 60 minutes.

Furthermore, I would like to assure that the process of data collection will not interfere with the regular school routine because the interview will be carry out during the educators non-contact time.

Yours faithfully

Signature

Daniyan Olatope Oladunni

Appendix D Letter requesting adult to participate in an interview

704 Prezin park, 282

Johan Heyn Street,

Gezina Pretoria.

0084

05 March 2015

Dear Colleague,

This letter is an invitation to consider participating in a study I Daniyan Olatope Oladunni am conducting as part of my research as a Master's student entitled 'Challenges experienced by teachers teaching learners experiencing barriers in mathematics in intermediate phase: Tshwane South District', at the University of South Africa. Permission for the study has been given by Tshwane South District Department of Education and the Ethics Committee of the College of Education, UNISA. I have purposefully identified you as a possible participant because of your valuable experience and expertise related to my research topic.

I would like to provide you with more information about this project and what your involvement would entail if you should agree to take part. The importance of the research project in education is substantial and well documented. Challenges experienced by teachers teaching learners experiencing barriers in mathematics in intermediate phase: Tshwane South District. The importance of the research is to contribute to pedagogy practice of teachers and to proffer possible recommendations that will help teachers handle learners facing barriers in mathematics learning. I would like to have your views and opinions on this topic. This information can be used to improve teaching and learning situation in mathematic classroom.

Your participation in this study is voluntary. It will involve an interview of approximately 45- 60 minutes in length to take place in a mutually agreed upon location at a time convenient to you. You may decline to answer any of the interview questions if you so wish. Furthermore, you may decide to withdraw from this study at any time without any negative consequences.

With your kind permission, the interview will be audio-recorded to facilitate collection of accurate information and later transcribed for analysis. Shortly after the transcription has been completed, I will send you a copy of the transcript to give you an opportunity to confirm the accuracy of our conversation and to add or to clarify any points. All information you provide is considered completely confidential. Your name will not appear in any publication resulting from this study and any identifying information will be omitted from the report. However, with your permission, anonymous quotations may be used. Data collected during this study will be retained on a password protected computer for 12 months in my locked office. There are no known or anticipated risks to you as a participant in this study.

If you have any questions regarding this study, or would like additional information to assist you in reaching a decision about participation, please contact me at 0787301623 or by e-mail at laduntope@gmail.com

I look forward to speaking with you very much and thank you in advance for your assistance in this project. If you accept my invitation to participate, I will request you to sign the consent form which follows on the next page.

Yours sincerely

Daniyan Olatope Oladunni

Appendix E. **CONSENT FORM**

I have read the information presented in the information letter about the study challenges experienced by teachers teaching learners experiencing barriers in mathematics in intermediate phase: Tshwane South District in education. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and add any additional details I wanted. I am aware that I have the option of allowing my interview to be audio recorded to ensure an accurate recording of my responses. I am also aware that excerpts from the interview may be included in publications to come from this research, with the understanding that the quotations will be anonymous. I was informed that I may withdraw my consent at any time without penalty by advising the researcher. With full knowledge of all foregoing, I agree, of my own free will, to participate in this study.

Participant's Name

Participant Signature:

Researcher Name: Daniyan Olatope Oladunni

Researcher Signature:

Date

APPENDIX F

SEMI-STRUCTURED INTERVIEW SCHEDULE:

Researcher: Olatope Oladunni Daniyan

Topic: challenges in teaching learners experiencing barriers in mathematics at the intermediate phase: Tshwane South district”

Supervisor: Mr A. Mdikana

Participant:

Date:

Time:

INTERVIEW QUESTIONS

First part:

In this part, teachers will be asked to provide their background details which will include their professional qualification, experience in the teaching professional, indicate the grades they are teaching and number of learners in their class, gender also their age.

Second part: research questions:

TEACHER

1. As a teacher your concern is that all learners should optimise their potentials, do you bother when learners are not matching up? And what do you do if a learner does not understand a concept?

TEACHING STRATEGY

1. How do you make a lesson content relevant and engaging for all learners? And can you tell me about a lesson that went well and why?
2. If you are approached with ideas or suggestions on how to improve teaching standards, how would you welcome such suggestions or ideas?

CURRICULUM AND STRATEGIES

1. Your school is among the prioritise schools selected for Gauteng Primary Language and Mathematics Strategy (GPLMS). What are the contributions of the strategy in addressing barriers in mathematics? Are the GPLMS contents relevant to learner's age and needs?

LEARNER SUPPORT

1. Giving learning support is one of the current curriculum requirement, some learner in your class require special needs as individual learning ability vary, how do you as a teacher ensure that learner that require additional support in mathematics is at par with the rest of the class?
2. What particular training do you undergo before the implementation of GPLMS strategy? Do you think the training is adequate enough?

ASSESSMENT

1. How do you assess your learner's strength and weakness? How does this type of assessment inform your teaching approach?
2. What kind of assessment techniques accurately capture what your learners are learning? In other word how do you assess whether your learners grasp what they were taught? And how often do you assess them?

APPENDIX G

EXAMPLE OF INTEVIEW WITH THE TEACHER (PARTICIPANT A)

Place: School number 1 (Pseudonym)

Participant: Teacher A (Pseudonym)

Researcher: good afternoon Sir

Participant: good afternoon Ma'am

Researcher: I will start by introducing myself; my name is Miss Daniyan a master student from university of South Africa. Eer am working on, sorry, am researching on a topic title "challenges in teaching learners experiencing barriers in mathematics at the intermediate phase: Tshwane South district". So, this study is about the challenges teachers encounter in their mathematic classes when they are dealing with learners experiencing barrier to learning that particular subject. Sir i will like your contribution on this topic. Eer (.....researcher chough) am sorry. Before we start the interview i will to clarify something, like the issue of your privacy and your school. I will like to say that all our discussion here will remain confidential, your name and your school name will not be mention when presenting the final dissertation for privacy sake. This interview will be recorded; the recordings will help me to capture accurate transcription of our discussion. I will ensure to send you the transcribed interview once am done typing, so that you can go through it... Because i will like to quote you correctly, so if there is any error or mistake you can help me make adjustment. This interview will take about 40- 60 minutes of your time, it is voluntary and you can decide to opt out. I divide the interview into two parts. In the first part i will be asking you about your profile details. And the second part is the research questions. I will like to know if you are comfortable with this sir.

Participant: oh yes I am

Researcher: shall we begin with the interview Sir?

Participant: yes

Researcher: first, can you please introduce yourself, your qualifications and your age?

Participant: my name is (name withdraw), I am 26 years of age. I teach in (school name withdraw). I got a diploma certificate in mathematics and presently am doing a corresponding course for my degree.

Researcher: Thank you so much. I will like to know how long have you being in the teaching profession?

Participant: This is my third year.

Researcher: so what grade are you teaching?

Participant: am teaching grade 6's and grade 7's.

Researcher: how many learners were they in each of the class?

Participant: in my grade 6 umm... am having 30 learners and in my grade 7 I have 32 learners.

Researcher: thank you so much for the information Sir; can we now proceed to the research questions.

Researcher: Are you concern if learners having learning barrier in mathematics is not meeting up with their peers in class?

Participant: I do, am always concern, I always tell them that I want 50% above, because if they are not matching up, it means I haven't done my bit at all. Like when you give them a task and none of them have up till 80% its worry me. So I do something. Last time they ask them to rewrite, I feel they will get used to it. Learners will think if they don't past they will have another chance to write it again. From my view it's a cheating. That is why I use mini test before writing formal task I have smaller yanner test, mostly on Fridays.

Researcher: so why did they have to rewrite?

Participant: I think they don't want to record lower marks, I didn't see the need because to me it's a cheating i don't like the idea. That is why i give mini test which I assess topic by topic knowing that all the topic will be assess in the formal task.

Researcher: how is their performance with the mini test?

Participant: umm..., yah is improving bit by bit.

Researcher: can you tell me how you make the lesson contents relevant and engaging to all the learners?

Participant: With the gr 6 most of the topic they have done them in their lower grade, it only the numbers that get bigger. But it much easier when I teach showing them concrete material, this help them a lot. Like when I was teaching fraction it was much easier when I draw the picture of a brick showing them that if you take 4 and then take 3 the fraction is $\frac{4}{3}$. But lack of resources to teach makes it difficult for the learners when we are teaching, they learn better if they can see concrete object.

Researcher: so using physical materials that learners can see and touch has influence on their learning?

Participant: yes, a lot.

Researcher: Eer... If you are approach on suggestion on how to improve your teaching, how do you embrace it?

Participant: For me i ask ma'am (the other teacher name withdrawn) for assistance. We then do a kind of collaborative teaching, as for me I cannot use new method directly because some inquisitive learner in my class might ask question and I won't want to embarrass myself in front of my learners, so i always ask ma'am (name withdrawn).

Researcher: was the collaboration helpful?

Participant: yes, it really helpful and am gaining a lot from my colleagues.

Researcher: Your school is among the prioritise schools selected for Gauteng Primary Language and Mathematics Strategy (GPLMS). What are the GPLMS contribution in addressing barriers in mathematic?

Participant: umm... GPLMS has help us a lot, it assist a lot because I learnt using many strategy from our coach before he left us so I continue using that and I think is working for us because it being very helpful, they give us the lesson plan and even the task. Because before it was very difficult for us to assess, you have to teach and you have to set questions,

assess, and you know some teachers are not using up to standard book they will just pass their learners. So GPLMS make things easier for us all teachers, yah it was much easier compare when you have you to write your lesson plan yah. And it make less work for us we no longer write lesson plan we get lesson plan and this year is the same as last year and we still using the same one, it's easier for us. And even the teaching is much better because you know you have done this before, you do it better as the year goes.

Researcher: you said the teaching is much better, can you please explain in what way?

Participant: umm you know what content you will be doing and you become more confident because you know you've done it before you just need to refer back to it because you know what's going to come up. So much easier that way than having to learn to prepare lesson plan every year like that stuff. You just refresh yourself and umm, you know if you use this strategy last year and it didn't work, you know how to approach it differently. Because if you see that you use one strategy and it working then it means you have to change it, so I think yah GPLMS has help us a lot.

Researcher: hum hum....

There is a lot of examples and strategy in GPLM, a variety of example actually, and it explains from the topic, umm from the beginning up to the end. And guide you the teacher on how to start your lesson, what activities to give or which book to refer to. Because it also includes the DBE book so if learners don't understand the textbook you can also give the DBE work to emphases more. There are varieties for the learners and also for the teachers. You can refer to others and also the GPLMS book. In 2013 the learner were given the GPLMS books which make learning easier for them and it make work easier for the teachers too, but this year and last year they were not given book for the learners. It is a challenge to get the learners to buy this book, especially in this school. They only use the textbook, the book serve as a guide to learners and much easier because it explains every topic to detail. The book makes work easy for the teacher and learners

Researcher: are you trying to say this pose a challenge to you as a teacher because the learners were no more given those practical books?

Participant: Not really, but the book help the learners a lot, it is repetitive and it guide them. And they get use to what they are learning, because the more they do it, it become better for them. Also it helps us teachers because learners were able to learn faster.

Researcher: were the GPLMS contents relevant to learner's needs and age?

Participant: It is relevant but is at fast pace. The pacing is the one am worry about because there are so many topics, and then the book says little. I think the more they do it is much better, so the book is also at fast pace. I don't believe that we need to rush in completing the book the learners need to know what they are learning. Because it's not about the finishing line but knowing what is the race or what you are racing for.

Researcher: so you think you are rushing them?

Participant: Yes, that why I tell my school I would rather write on the last day of exams because I know I would have cover every things. Even when they set the timetable they don't consider where you are and how far you have gone, they just tell you that you need to write exams. I even complain to the school authority that we are not happy about the timetable. They only believe you just have to write an exam not considering what you have done.

Researcher: so after presenting your complain was the issue addressed?

Participant: they tried to solve the timetable issue but still I think we are rushing the learners. Umm.... we have learners that are slow, so this makes it so hard for them to finish their work and it not easy when you rush them.

Researcher: Giving learning support is one of the curriculum requirement, some learners in your class require special needs as individual learning ability vary. How do you ensure that your learner that requires additional support is at par with the rest of the class?

Participant: We have design umm... intervention books, in the first term we notice those one who are not performing well then we give them the books, and as you teach them with the rest of the class they have two books unlike the other learners whereby they write their extra work, the intervention given to them on the other book. And some time and again a woman comes to see if we are really supporting the learners or not.

Researcher: who is this person coming to check on you to ensure you are supporting the learners?

Participant: Think from the district, Mrs (name withdrawn) was the one checking the books.

Researcher: do you have support team in your school?

Participant: Yes, we have team, we do have the SBST, Mrs (name withdrawn) is the one who check in the school to see we are supporting the learners

Researcher: how are the members of the SBST helping you regarding learners that require additional support?

Participant: I think we are helping ourselves especially in maths (laugh...) because we are the one who identify our own learner in our subject, then we will be the one to make sure they get extra work, the support work they need.

Researcher: is there any improvement?

Participant: Yes, i have seen improvement from the grade 6 but sometime it become difficult because the one that need to attend never attend, they give excuses. Lately there some learners who go to field for sport, for me I believe the first priority of learners is to come and learn not for other activities. It is not beneficial to the learners because their first priority is to come and learn. And some give you excuses of transport or my mum didn't give me money to stay behind and stuff. So it becomes very difficult to do after school classes. Extra classes should be on going because when we do it at the end of the term, we realise is too late to help the learners, most teacher only wait for them to write a test before they start helping (intervention). You cannot judge a learner like that, that is why I use a mini test on Fridays to see if they have grasped what I teach them during the week.

Researcher: so is the mini test really working and helpful for the learners?

Participant: Yes for my class its working because am able to identify where they are lacking before I move to another topic. That why I say the pace for the GPLMS is too fast, because you find that some were behind for two weeks because you have to emphases more, give more work on the previous topic.

Participant: I use mini test mostly on Fridays to check where the learners are lacking and their improvement

Researcher: before using the GPLMS strategy do you went for any particular training?

Participant: I went for PLG training, we are still attending the (PLG) it is on-going training where we share ideas and challenges, and help each other to solve problems.

Researcher: so it seems that you did not go for a particular training on GPLMS?

Participant: yes, but am attending the PLG, This meeting is helpful because we help each other by sharing ideas. And even in our school we teachers come together to discuss our problems and its helping a lot. We sit in our grade we discuss how far we are; we share ideas because as you share ideas in a group there are more ideas than you thought.

Participant: This is my first time of teaching grade 6 I don't wanna lie, I even told the school not to expect wonders but so far they are doing much better. Even doing better than when the previous grade teacher was with them yah! Yah!

Researcher: so how do you assess your learners' strength and weakness?

Participant: Ah like I said I use mini test, sometime I also make them do small project just to see if they understand what is happening. Sometimes i give them task and tell them they must do it in group and i will give them two mouths. Like the fraction we are doing is in the DBE book there was this other game about place values I use to teach it and they enjoy it, they actually grasped what's happening about it because they are involved. Because when they enjoy it more it get inside their brain and they also see it, unlike me coming into the class and telling them to do this and that.

Researcher: what kind of assessment accurately captures what your learners are learning? I mean which assessment really tells that your learners have grasped what you are teaching them?

Participant: I think like the one I have said the practical one and also sometime asking them orally. We also do counting in every period for three minute you ask them (...snapping fingers). Even peer assessment were they give each other's small task and they mark for

each other, I think is better to use variety to judge their performance. There're some when you sit with them they can explain to you but when they have to put it done it's another story, I which it were possible for us to maybe umm... record and mark, yah! I don't know if it's possible. But when they are talking they say the right thing but when they have to write it, it's become difficult.

Researcher: so what do you think is the cause of that?

Participant: For others I think language is the problem, because you find that the question paper comes in English but sometimes you have to stop and explains in their mother tongue. They find it difficult to comprehend English and its killing them, even if you tried in maths class to tell them that we speak English, but when they get to other class they use different language and lack of consistence is not helping the learners. They find it difficult to comprehend English and its killing them. I think some don't even understand the question, what the question is asking, they just answer without reading the question. I think language barrier is the problem. And also we spend time teaching the content not letting the learners know how they will be assess, learners need to how the question will be ask. We only rush to give them knowledge but not how the knowledge we are asked. Because we cannot always blame the learners only but sometime we have to blame ourselves.

Researcher: hum.... Hum...

Participant: I do speak English with them, but for the grade 6 language is a challenge they don't understand when you teach or say something in English they just agree but when you give them work they will Sir, 'o itseng' You just have to go back and explains in their mother tongue, it also waste a lot of time because you have to explain again, you just have to go back again and only a few really understand. Also the terminology use I think is a bit high for the grade 6's. I think they enjoy today paper because there is a lot of diagrams unlike, seeing paper that says define this, or calculate that without diagrams, so if learners see illustration in form of diagrams they perform much better.

Researcher: thank you. So what other challenge do you experience in teaching mathematics?

Participant: I think parent support, even the worst learners are not getting support from their parent, even when you called the parent to come they don't come, you write letter asking them to come they don't come i even write in the learner book, they don't check the book and don't sign. So the learners can see that their parents are not interested so they also feel like they are just wasting their time. Even as a parent if you don't know maths but if you give your children support by asking them to practice and read their book, I think is good. I as a teacher I need to work with them to know if something is happening. Because even the smart one fail and when you ask them they will tell that is something happening at home. Even the learners open up and talk to us about their problems. Other challenge is the learners themselves, they have this phobia, and there this thing going around that maths is difficult, I always tell them to forget their previous fear and marks. These learners this day don't have dreams, is like they are being force to come to school. From my side i use to paste the learners result at the class entrance for everyone to see, this measure make them work harder.

Researcher: don't you think this can demoralise the learners?

Participant: No, I have being using this measure for a while and it's working for me, because the learners know that their result will be posted on the wall, this makes them to work harder.

Researcher: so do you have any additional challenge you will like to share and discuss?

Participant: like I said the challenge of parents not wanting to help and cooperate with us is really affecting us. Also language barriers, the learners are not motivated to study. That's all; umm... I think I have said it all.

Researcher: thank you very much Sir for your cooperation, I really appreciate your contribution and the time spare toward this research work.

Participant: you are welcome ma'am.

