TEACHERS’ AND LEARNERS’ EXPERIENCES AND PERCEPTIONS CONCERNING THE USE OF ENGLISH AS A LANGUAGE OF LEARNING AND TEACHING IN BI/MULTILINGUAL MATHEMATICAL LITERACY CLASSROOMS

S. PILLAI

2013
Teachers’ and learners’ experiences and perceptions concerning the use of English as a language of learning and teaching in bi/multilingual mathematical literacy classrooms

By
Saloshni Pillai

(Student Number: 206582740)

A thesis submitted for the degree of

Master of Education

December 2013

Supervisor: Dr. Lyn Webb
DECLARATION

I declare that this research investigation as reported is my own work, except for acknowledgements as duly indicated. It is being submitted according to the requirements for the degree of Master of Education at the Nelson Mandela Metropolitan University, Port Elizabeth. It has not been submitted previously for any other degree at any other University.

Signed
Saloshni Pillai

06th day of DECEMBER 2013
ABSTRACT

In South Africa, there is concern about the poor achievement by first additional language (FAL) English learners in mathematics, and this is a consequence not solely of the apartheid era but more appropriately, the existing current situation in the classroom. Since 2006, the Department of Basic Education in South Africa introduced mathematical literacy (ML) as another learning area for the Further Education and Training (FET) band. ML, as an alternative choice to mathematics, is envisaged as a key to the understanding of our everyday world filled with numbers. Mathematical literacy FAL English learners and teachers are exposed to a ML curriculum that demands high linguistic skills in English in order to engage with the mathematical concepts through the medium of English which is not their home language. While the Language-in-Education Policy (DoE, 1997) recommends that school language policies promote additive bilingualism and the use of learners’ home languages as languages of learning and teaching (LoLT), there has been little implementation of these recommendations by schools, for the reason that all assessments and learner and teacher support materials (LTSM) are only available in English. Thus it appears that ML creates a language gap when FAL English learners and teachers have to possess a high level of communication and language proficiency of the LoLT English to successfully engage with the mathematical context and content of the ML curriculum since the language itself carries all the meaning. The majority of FAL English learners and teachers struggle with the necessary English language proficiency to successfully interact with the ML curriculum and are often required to use their own home language (code switching) to bring about understanding.

In this study, I explore how teachers and learners who are dominantly FAL English speakers, engage in teaching and learning of ML in bi/multilingual classrooms. The main aim of the study is to investigate the FAL English learners’ and teachers’ experiences and perceptions concerning the use of English as the LoLT in bi/multilingual ML classrooms. Qualitative measures were generated through personal interviews (teachers [n=15] and learners [n=25]) from five different secondary schools situated in the rural areas of the Midlands in KwaZulu-Natal. This study is framed by Wenger’s (1991) model of situated learning and Vygotsky’s socio-cultural perspectives, which propose that learning involves a process of engagement in a community of practice and reflects the learners’ socio-cultural relationship to school mathematics respectively. The study also describes
Cummins’ quadrants and explores the benefits of Cummins’ notion of language use (Cummins, 1984).

Analysis of the semi-structured interviews revealed that, despite both teachers’ and learners’ difficulty with the language, English is the more popular language to be used in teaching and learning in bi/multilingual mathematical literacy classrooms since English is accepted as a global language. Worldwide emphasis and dominance of English as a powerful language that gives access to goods and social mobility were also highlighted. However, overall results in this study showed that most participants did express their preference for using their home language isiZulu alongside English through the extensive practice of code switching for the teaching and learning of ML.

**Keywords**
Bi/multilingual
South Africa
Mathematical literacy
Code switching
Language use
English as LoLT
FAL English learners and teachers
isiZulu
ACKNOWLEDGEMENTS

Firstly, I would like to thank Lord Vishnu for giving me the wisdom, strength and guidance to complete this study.

I would also like to acknowledge and thank the following people who helped make this possible:

- My supervisor, Dr. Lyn Webb for her continued guidance, wisdom, patience, support and encouragement throughout this study.

- I gratefully acknowledge the financial assistance provided by NMMU.

- Mr Sikhumbuzo Xolani Mccollin Buthelezi, for your time and assistance with the translation/interpretation of the isiZulu into English and vice versa. You have made an invaluable contribution to this study.

- Principals of the participating schools for their permission to conduct this study and to all teachers and learners who participated in this study. I appreciate you sharing your loads of experiences with me and without your contributions this study would not have been possible.

- My work colleague, Mr. Fayeez Rassack, for his time and assistance with the technical issues involved in this study.

- My work colleague, Mrs. Fathima Ghasita for her time and assistance with the final language edit of my study.

- My in-laws who have borne a remarkable child, my husband.

- My husband Dion who has been my pillar of strength, for his love and support throughout the study.

- My children Kiasha and Temisha for always sharing me with my studies.
DEDICATION

This study is dedicated to my late in-laws, Dan and Ruby Venga. These two great souls who produced an amazing son, my husband Dion, who has always believed in me and spurred me on even when times were challenging affecting my health and wellbeing during my studies.
# TABLE OF CONTENTS

COVER PAGE .................................................................................................................................................. i  
TITLE PAGE .................................................................................................................................................... ii 
DECLARATION .................................................................................................................................................. iii 
ABSTRACT ....................................................................................................................................................... iv 
ACKNOWLEDGEMENTS ............................................................................................................................... vi 
DEDICATION .................................................................................................................................................... vii 
TABLE OF CONTENTS ................................................................................................................................. viii 
LIST OF FIGURES ............................................................................................................................................ xi 
LIST OF TABLES .............................................................................................................................................. xii 

CHAPTER 1: INTRODUCTION TO THE RESEARCH .................................................................................. 1  
1. THE RATIONALE OF THE RESEARCH ................................................................................................. 1  
2. THE LANGUAGE-IN-EDUCATION POLICY (DoE, 1997) .................................................................... 3  
3. BACKGROUND – SUBJECT ORIGINS OF MATHEMATICAL LITERACY IN SOUTH AFRICA .............................................................................................................................. 6  
4. THE SUBJECT MATHEMATICAL LITERACY – DEFINITION, PURPOSE AND DEVELOPMENT IN SOUTH AFRICA ........................................................................................................ 9  
5. THE SUBJECT MATHEMATICAL LITERACY – ITS CHARACTERISTICS ............................................ 10  
6. THE POWER OF ENGLISH ..................................................................................................................... 12  
7. RESEARCH PROBLEM STATEMENT ..................................................................................................... 13  
8. RESEARCH AIMS ..................................................................................................................................... 15  
9. RESEARCH OBJECTIVES ....................................................................................................................... 15  
10. RESEARCH QUESTION ........................................................................................................................ 16  
11. RESEARCH DESIGN AND METHODOLOGY .................................................................................... 16  
  11.1. Sample and Setting ......................................................................................................................... 17  
  11.2. Data Collection .............................................................................................................................. 17  
  11.3. Data analysis procedures .............................................................................................................. 18  
12. ETHICAL CONSIDERATIONS .............................................................................................................. 18  
13. OUTLINE OF THE STUDY .................................................................................................................... 19  

CHAPTER 2: THEORETICAL FRAMEWORK AND LITERATURE REVIEW ........................................ 21  
1. INTRODUCTION ....................................................................................................................................... 21  
2. THE DEFINITION OF A COMMUNITY OF PRACTICE ......................................................................... 22  
  2.1. The three structural characteristics of a community of practice ..................................................... 23  
  2.2. The ML curriculum as a shared domain of interest ........................................................................ 24  
  2.3. Use of the ML policies in creation of environments in the classroom ........................................... 27  
3. VYGOTSKY’S UNDERSTANDING OF COGNITIVE DEVELOPMENT .............................................. 30  
  3.1. The Social Construction of Learning ................................................................................................. 31  
  3.2. Internalisation – From Speaking to thinking .................................................................................. 32  
  3.3. Spontaneous vs. Schooled Concepts ............................................................................................... 34  

viii
LIST OF FIGURES

Figure 1
Parallel representation of Wenger’s theory of a “community of practice” (Wenger et al., 2002, p. 28) ..............................................................................................................................................23

Figure 2
Representation of the three identifying structural characteristics of a “community of practice” as it can occur with a ML curriculum ..............................................................................................................27

Figure 3
“Community of practice” – stages of development – with a typical ML curriculum (adapted from E. Wenger, 1998) ........................................................................................................................................30

Figure 4
The design of a ZPD (Vygotsky, 1962) ........................................................................................................................................................................36

Figure 5
Cummins’ Quadrants (NMMU study guide 2010 – Bed Honours – PHE 409) ................42

Figure 6
The inter-related nature of mathematics (content) and context (Brombacher, 2007, p. 14) ..............................................................................................................................................................................44

Figure 7
Research paradigms – a conceptual model of assumptions (Smith, 1988, as cited in du Plooy, 2009) ......................................................................................................................................................53

Figure 8

Figure 9
General process of data analysis (Macmillan & Schumacher, 2010, p. 368) ..........72
# LIST OF TABLES

**Table 1:**
Interpretive and Constructionist paradigms (Terre Blanche et al., 2006, p. 7) ...............52

**Table 2:**
Overview of the FET phase teachers from the participating schools ..........................60

**Table 3:** Overview of the participating schools with their corresponding quintile status and the participating teachers in this study ..........................................................61

**Table 4:**
Overview of the average number of learners per grade in the FET phase choosing mathematics and ML in the participating schools with comparison to the researcher’s school ........................................................................62

**Table 5:**
Themes and Categories .........................................................................................74
CHAPTER 1

INTRODUCTION TO THE RESEARCH

In schools throughout South Africa (SA) the majority of children receive their basic education largely through the medium of a first additional language (FAL) English, which, in many policy documents, is referred to as a second language or L2 (DoE, 2003, 2006). In this research, I focus on the issue of using FAL English as a language of learning and teaching (LoLT) in bi/multilingual mathematical literacy (ML) classrooms in South Africa. This research involves the investigation of the FAL English learners’ and teachers’ perceptions and experiences concerning the use of English as a LoLT, whose home language is isiZulu, in their bi/multilingual ML classrooms. I explore teachers’ and learners’ perceptions, experiences, challenges, problems, strategies and solutions in bi/multilingual ML classrooms in each of the 5 selected rural secondary schools in KwaZulu-Natal (KZN).

In this chapter, the research study is mapped starting with the rationale for the research; other sub-sections include the Language-in-Education Policy (DoE, 1997); subject origins of ML in South Africa; the definition of ML, its purpose and development in the South African context; the subject ML and its characteristics (DoE, 2006; DBE, 2011) and the power of English as described by other researchers on multilingualism in other provinces in SA and in other countries (Heugh, 2002; Moschkovich, 1996, 1999; Setati & Adler, 2001; Setati, 2005a). The research problem for this investigation is outlined; followed by the aim; the objectives; the research question and sub-questions. An overview of the research design and methodology, which includes the sample and setting; data collection; data analysis procedures and the ethical considerations, is sketched. Finally, an outline of the study is presented.

1. THE RATIONALE OF THE RESEARCH

In SA, the Department of Basic Education (DBE) introduced another learning area, ML to be part of the National Curriculum Statement (NCS) (DoE, 2006). Although
this subject ML is viewed as a means for the majority of South Africa’s citizens to become mathematically literate, new challenges and problems have been created. The main idea underpinning the introduction of the ML curriculum (DoE, 2003a; DBE, 2011) is the inter-related nature of the mathematical content with context. According to Brombacher (2007), the word problem solving that is part of the ML curriculum needs to be relevant and applicable to the learners’ real-life situation so that the context of the mathematical problem becomes a vehicle that gives meaning to mathematical knowledge and concepts (content). Herein lies the problem or the challenge that South African teachers and learners are faced with. Instead of mathematical computations, the ML content is presented with words and context packed around numbers. The problem solving tasks are so bombarded with academic literacy in order to bring about meaning to the mathematical content, that it brings about a new barrier to the teaching and learning of ML in bi/multilingual classrooms. This barrier can be described as a language gap between the learners’ English proficiency and the linguistic demands of learning the mathematical content and context through the LoLT English, which is not their home language.

Thus, it appears that the majority of FAL English teachers and learners of ML will require a high level of communication and language literacy skills of the LoLT English to bridge the gap required for academic learning and meaningful engagement with the ML curriculum. Research evidence (Heugh, 2002) describes that the lingua franca amongst learners and teachers in rural schools is their common home language, with the use of English being confined to the classroom only. According to De Lange (2003) to be able to communicate mathematically requires integration of language literacy skills such as; oral, written and other visual form and the understandings of someone else’s work, by teachers and learners alike. Therefore, the language practices within bi/multilingual classrooms that were investigated by researchers, such as Heugh (2002), as a barrier to learning and teaching are relevant in a ML situation in SA. This research is spurred by my own experience as a teacher in my bi/multilingual ML classroom. The focus of this research is to elicit the perceptions and experiences of FAL English teachers and learners so that the challenges and problems associated with the LoLT English in bi/multilingual ML classrooms are revealed.
Research (Heugh, 2002) has shown that the challenges in South Africa and other countries originated because of inequities in the apartheid education system where FAL English teachers in former coloured and black schools were poorly trained and under qualified. Apart from the language barriers that schools are faced with, the legacy of poor pre-service training programmes that were “often inadequate” in “concept, duration and quality” (DoE, 2001, p. 22) were major restrictive factors with regard to curriculum change in SA. It is, however, critical to acknowledge that while ML is indeed a national solution, the role of ML as a curriculum change has created new challenges. The challenge for the ML teacher is to establish a balance between firstly, a focus on the contexts with the degree of the academic literacy and secondly, the development of the competencies, both mathematically and with the language literacy skills that can be applied to an expanding range of contexts that become more complex each year. Thus, it appears that ML creates a language gap when FAL English learners and teachers have to possess a high level of communication and language proficiency of the LoLT English to successfully engage with the mathematical context and content of the ML curriculum since the language itself carries all the meaning. The majority of FAL English learners and teachers struggle with the necessary English language proficiency to successfully interact with the ML curriculum and are often required to use their own home language (code-switching) to bring about understanding Setati (2005a).

2. THE LANGUAGE-IN-EDUCATION POLICY (DoE, 1997)

Although the Language-in-Education policy (LiEP) changes were motivated by the government’s aim to “redress past injustices in educational provision”, they have not resulted in any major changes, as English is still retained as a LoLT, in bi/multilingual classrooms (DoE, 1997, p. 1). While there is legislation (DoE, 1997) in place to strengthen and sustain isiZulu along with the other official African languages in South Africa, Heugh (2002) states that there is no sign of change or development in the majority of the formerly black government schools, where the lack of proficiency and incompetence in the LoLT English aggravates an already insufficient educational system. The LiEP (DoE, 1997) recognises that there are 11 official languages: Sesotho; Sepedi; Setswana; Tshivenda; Xitsonga; isiNdebele; isiXhosa; siSwati and isiZulu as well as English and Afrikaans, and promotes
additive bilingualism (where two or more languages are used as the medium of teaching and learning).

Burkett, Clegg, Landon, Reilly and Versters (2001), argue that while the LiEP (DoE, 1997) promotes additive bi/multilingualism by maintaining home languages, it is clear that in practice this has not in the last 15 years extended to using more than one language as a medium for learning in a classroom and thus “it has been viewed only in terms of providing an additional language as a subject” (p. 151). The prospect for children educated in a subtractive bilingual context (it is applied to a context where a learner’s home language is abruptly or gradually replaced as a language of learning in the school and the learner is required to become proficient in a second language usually of high status) has major implications for education in SA. Burkett et al. (2001), further elaborate that a situation such as this is likely to have the greatest negative effect on children in rural and peri-urban black schools who have the least exposure to English in their daily lives and who have the widest gap to make up as they learn through the medium of English at school.

Research such as Heugh (2008) about the teaching in multilingual settings has been piloted by organisations such as Project for Alternative Education in South Africa (PRAESA) concurs with the language policy changes have occurred, however there has been little implementation of the revised policy. It has been revealed by Heugh (2008) in reports by PRAESA (2007) that although South Africa has a long tradition of using more than one language as a parallel media of education within the same school, there are very few schools which are delivering the curriculum bilingually. At school level the school governing body (SGB) take on the responsibility of deciding on the language policy that is suitable according to the demographics of the school. The LiEP (DoE, 1997) supports the use of language practices such as code switching (DoE, 2003), however overvaluing English and undervaluing the nine official African languages is still prevalent in South African classrooms (Setati, 2005a). This is evidenced by the LoLT English being retained in the majority of South African bi/multilingual classrooms.

According to Setati (2005a) and Gee (1994), parents, learners and teachers view English as access to social mobility and goods. Many researchers (Foley, 2007;
Gee, 1994; Heugh, 2002; Setati, 2005a) show the importance of acquiring proficiency in English, but not at the expense of the learners’ mother tongue. Many children start school and may not obtain a solid foundation in their early years with regards to the cognitive and language literacy skills in their own home language and in addition they may not attain the preparation in cognitive and literacy skills for English as the LoLT as well. The very ingredients to make the transition successful becomes challenging for the learner. This transition from the home language to the LoLT English may come as a shock to many learners because of their lack of skills in their home language as well as the LoLT English. Foley (2007) describes that it becomes more difficult for many learners to understand lessons well enough in secondary schools because the language gap between children’s knowledge of English at the switch of the medium and the language demands of the curriculum are large (Foley, 2007).

According to Foley (2007), educationalists have proposed that African language learners should be taught in their mother tongue for at least the first 3 years of school before switching over to English. In SA there was a proposal by the then Minister of Education Naledi Pandor that the initial period of mother tongue instruction could be extended to 6 years (Pandor, Opening Address at the Language Policy Implementation in HEIS Conference, 2006). Foley (2007) points out that this is a serious matter that needs to be clarified and considered. Foley (2007) describes that if this proposal is to be universally implemented then new challenges and difficulties will be encountered during its implementation, such as: language development where the standard written forms of the languages have not yet been developed to the point where they are able to carry academic discourse effectively and therefore function as languages of learning and teaching; the curriculum development should include the full translation of the National Curriculum Statement (2006) into the African languages to be used as languages of learning and teaching; teacher education involves the necessary skills, knowledge and ability to use the African languages as the media of instruction for the entire curriculum; and school implementation where the concern is whether schools will actually adopt the new policy and implement it accordingly. Many researchers in their studies have substantive data to support the positive effects of mother tongue instruction and
therefore such a proposal in South Africa is possible (Adler, 2001; Foley, 2007; Gee, 1994; Setati, 2005a).

3. BACKGROUND – SUBJECT ORIGINS OF MATHEMATICAL LITERACY IN SA

Since democracy, a transformation of the education system has become a necessity. The former apartheid education system was established to benefit the minor population of SA and limit the majority black population to inferior education (Akhurst, 1997). The way in which the past education system organised secondary schooling made it very difficult for the poor and oppressed youth to realise high expectations so as to enter higher education or the world of work because of the lack of knowledge and necessary skills (DoE, 1997). One of the major ideologies influencing the past education system was that the white children should be prepared for leadership whereas black children were to be trained mainly to work as labourers or in subordinate positions (Akhurst, 1997). Current education legislature in SA points towards building a culture of learning and teaching that aims to achieve quality education for all learners, where differences or diversity among learners are respected, and where all learners are given the opportunity to learn and participate fully in the curricula of schools and learning institutions (DoE, 2003a). The emphasis in education should create equal opportunities for effective learning by all learners so that they can develop to their full potential along the most appropriate pathway (DoE, 2003a).

According to Christiansen (2006) the implications of the National Curriculum Statement for Mathematical Literacy (DoE, 2003a) can include the “improvement of living conditions, social justice and democracy, in other words overcoming the apartheid legacy” (p. 6). Christiansen (2006) pointed out that the inclusion of the subject in grades 10 - 12 might lead to transformation and an improvement of socio-political conditions of the South African society, in order to overcome the historical barrier of apartheid. If learners use mathematics flexibly in real-life situations it will empower them to make responsible decisions which could lead to improved living conditions.
For economic growth and increased societal development in South Africa, there has to be an increased workforce that possesses adequate mathematical skills and an increased number of students accessing higher education (DoE, 2001). The importance of “mathematics for all” is self-evident since social transformation in SA demands it (DoE, 2001, p. 92). The same theme prevails through the Curriculum and Assessment Policy Statement (CAPS) (DBE, 2011) which provides a structured, clear and practical guideline of the NCS (DoE, 2006).

The Lifelong Learning through a National Curriculum Framework published in the White Paper on Education and Training (DoE, 1995) and The National Education Policy Act (DoE, 1996) promoted a vision of a prosperous, truly united, democratic and internationally competitive country with literate, creative and critical citizens leading productive, self-fulfilled lives in a country free of violence, discrimination and prejudice.

The above policy makers used “literate” which could imply language literacy as well as other literacies including mathematical literacy. Brombacher, (2007), articulates that although there is a strong demand for more participation and success in mathematics, the nature of the mathematics has to be re-examined. This is supported by the following excerpt from the mathematics and science curriculum, the curriculum is “academic, outmoded and overloaded” and “…science and mathematics education, both formal and non-formal, has resulted in low levels of scientific and technological literacy” (DoE, 1994). For decades now, the South African government has emphasised the need for more access to mathematics, it is obvious to the curriculum planners that this must be a different form of mathematics, a kind of mathematics that will firstly, enable learners to embrace the subject and secondly, become more meaningful in their everyday lives. The current CAPS documents in ML bear testimony to the same sentiments as the 1994 democratic government and has revised the NCS to help teachers to “unlock the power” of the curriculum (DBE, 2011).

With the implementation of ML as an additional subject for the Further Education and Training (FET) band in South Africa in 2006, policy makers believe that ML, not mathematics, is the means to the understanding of our everyday world filled with
numbers (DoE, 2003a; DBE, 2011). Virtually every aspect of our lives depend on data, projections, inferences, and systematic thinking (Brombacher, 2007). This ranges from “selecting telephone services to buying a car, from managing household expenses to saving towards your retirement” (Brombacher, 2007, p. 3). The South African government has realised that to develop an informed citizenry and to support a democratic government, schools must educate learners in mathematical literacy (Brombacher, 2007). Although mathematical literacy, numeracy and quantitative literacy come from different perspectives, globally they have developed into having similar intentions and covering vast common areas (Steen, 2001). In another research by Steen (2003) he responds to the increasing need for ML (or quantitative literacy as it is termed in USA) by stating:

These changes signal a profound shift in public expectations for the mathematical performance of high school graduates, a change that is sweeping the globe as nations race to keep up with rapidly advancing information technology. (p.54)

The changes that Steen (2003) refers to are the most radical transformation in mathematics education in the last two centuries by tertiary institutions in USA where mathematics as a subject for the academic elite is now a core subject for all students.

ML is a subject that was introduced to educate the majority of the people in SA with some form of mathematics so that they could confidently participate in a modern world filled with data and numbers (DoE, 2003a). Also, the reviewing of the traditional mathematics in schools by the curriculum planners showed that the traditional mathematics was considered to be abstract for the majority of students, especially those who would not seek higher education programmes in these fields, therefore the nature and purpose of traditional mathematics was transformed from the ground up, to become a new subject involving a new curriculum in mathematics, known as ML, to include more meaningful and enabling mathematics to learners.

The resulting research by Kilpatrick, Swafford and Findell (2001) on developing number sense states that “Mathematics is one of humanity’s great achievements and thus those citizens that cannot reason mathematically are cut off from whole realms of human endeavour” (p. 1). De Lange (2003) provides a simple reason for
this notion, “mathematics curricula have focused on school-based knowledge whereas mathematical literacy involves mathematics as it is used in the real world” (p. 80). Brombacher (2007) elaborates on the notion of being mathematically literate by reporting that for professional mathematicians, engineers, physicists and economists the priority is to use sophisticated mathematics in complex settings which require a deep understanding of the structure of the mathematics they are using, while for mathematically literate people the priority is to interpret and to act on the day-to-day contexts that define their lives and the world in which they live. It is clear that the notion of De Lange (2003) and Brombacher (2007) describes the need to have more to do with the ability to apply mathematics than to understand it in the abstract way a scientist, engineer or mathematician might.

4. THE SUBJECT MATHEMATICAL LITERACY – DEFINITION, PURPOSE AND DEVELOPMENT IN SOUTH AFRICA

ML refers to a school subject in South Africa; ML refers to the general notion of numeracy, quantitative literacy, mathemacy or functional mathematics (Hechter, 2010). According to the NCS and CAPS for ML, the definition of ML is the following:

Mathematical literacy provides learners with an awareness and understanding of the role that mathematics plays in the world. Mathematical literacy is a subject driven by life-related applications of mathematics. It enables learners to develop the ability and the confidence to think numerically and spatially in order to interpret and critically analyse everyday situations and solve problems. (DoE, 2003a, p. 9; DBE, 2011)

The Department of Basic Education (DBE) envisages that the inclusion of ML would highlight the purpose of mathematics in real-life contexts. The above definition shows the interplay of both mathematical content and context. The notion of these two components forms the focal point of the subject ML and thus it must be interconnected in the teaching and learning of the subject (DoE, 2003a; DBE, 2011). According to the DoE (2003a), the subject ML will hopefully lead to the development of a “self-managing person, a contributing worker and a participating citizen in a developing democracy” (p. 10). The Subject Assessment Guidelines (SAG) (DoE, 2008) and the Curriculum and Assessment Policy Statement (DBE, 2011) document
for ML elaborate that the teaching and assessing of ML content should not take place in the absence of context. The SAG document for ML (DoE, 2008) further elaborates that “teachers must be involved in using appropriate contextual questions that reveal the underlying mathematics or content” (p. 7). The CAPS (DBE, 2011, p. 9) reveals the same sentiments as that of the NCS (DoE, 2003a) when it outlines that the primary aim of this subject is to equip learners with a set of skills that transcends both the mathematical content used in solving problems and the authentic real-life contexts in which the problem is situated.

According to Brombacher (2007), “Mathematical literacy is a way of thinking, a way of behaving and a way of relating to the numerically based world in which we live” (p. 2). He further elaborates that by being mathematically literate, one is able to engage with, make sense of and act with confidence on the numerically-based information that characterises the world in which we live (Brombacher, 2007). This view links to the opinion shared by the DBE in the NCS (DoE, 2003a) and CAPS (DBE, 2011), documents, which illustrates that ML focuses on the use of basic mathematical skills in solving real-life contextual problems in order to promote the development of life-skills. The contexts might include financial issues, map reading, timetables, estimation of areas and volumes, understanding of house plans and sewing patterns, reading statistical charts, and developing a critical stance with regard to mathematical arguments in the media (DoE, 2003a; DBE, 2011).

5. THE SUBJECT MATHEMATICAL LITERACY – ITS CHARACTERISTICS

According to Brombacher (2007) the traditional mathematics curriculum in SA does not prepare its citizenry to participate in, contribute to and make meaning of the data and number-drenched world that we live in (p. 3). He further explains that many South African learners exit school with very little useful mathematical knowledge or too much unnecessary mathematical knowledge that they will never use again should they not further their education to a tertiary level. So, ML is a different sort of mathematics. ML and mathematics are different school subjects. The similarity is that they are both inter-related because they deal with numbers, mathematical knowledge and skills but, in very different ways. According to Venkatakrishnan &
Graven (2006), the African National Council policy document (1994) called for science and mathematics education to be:

Transferred from a focus on abstract themes and principles to a focus on the concrete application of theory to practice. It must ensure that students and workers engage with technology through linking the teaching of science and mathematics to the life experiences of the individual and the community. (p. 17)

For an engineer or a physicist, mathematical knowledge and skills provide tools in his job. The manipulation of axioms, models and/or theorems (mathematical structure) is central to their job to facilitate problem-solving. In SA, an embedded ML curriculum aim is that learners will be able to use the mathematical knowledge and concepts constructed in the classroom in real-life circumstances (DoE, 2003a; DBE, 2011). So the notion of ML is to move away from abstract knowledge towards the application of knowledge in practice. Many researchers (Brombacher, 2007; Steen, 2001) argue that learners have to be taught to make a link between mathematical content and real-life contexts. Brombacher (2007) states that, “mathematically literate people use mathematics and mathematical artefacts to make sense of their world” (p. 3). Unlike engineers or physicists, mathematically literate people use elementary mathematics to be able to engage with day-to-day contexts in their lives. The main concern for these people is the power of mathematics and not the structure of mathematics.

Brombacher (2007) defines the characteristics of ML as:

ML:
- is a functional competency needed by individuals living in the twenty-first century.
- involves the confident and independent application of elementary mathematics in sophisticated and meaningful contexts.
- is developed through interplay between mathematical content and relevant contexts.
- is different from mathematics not in level or complexity but rather in kind and purpose. (p. 12)
The main idea underpinning the ML curriculum is the inter-related nature of mathematical content and context. The word problems that are part of the ML curriculum need to be relevant and applicable to the learners’ real-life situation so that the context of the problem makes meaning to mathematical knowledge and skills (content). The learner should be able to identify with and understand the scenario within the ML problem and therefore does not build a resistance to the acquisition of mathematical knowledge (DoE, 2003a; DBE, 2011).

6. THE POWER OF ENGLISH

In de Klerk’s study (2002) she highlights that many parents love their mother tongue, but the pressures of a modern society and global influences steer their minds to the advantages of being fluent in English. Her study revealed that parents force their children to learn in English but they themselves do not know the language. In essence, South Africans see English as having access to “social and economic power” and class, but English represents a threat to the development of the other 9 official African languages (Setati, 2008, p. 103). Cummins’ (2000) article on the importance of the mother tongue education explains that this threat is viewed as a destruction to the mother tongue (MT) culture and identity. Similarly in SA, de Klerk (2002) in her study on the language issues at schools describes this threat to be the loyalty to the mother tongue traditions and culture being questioned and criticised.

Why is it that parents, learners and teachers emphasise their preference for English as LOLT? More so, since it is suggested by several researchers (Adler, 2001; Cummins, 2000; Heugh, 2002; Moschkovich, 1996, 1999; Setati, 2005a, 2008) worldwide and in SA that mother tongue instruction (MTI) is a resource to extend learning. Are black parents in Kwa-Zulu Natal now rejecting isiZulu? Cummins (2000) states that the consequences for children and their families are disastrous, when parents, teachers and the learners themselves renounce an allegiance to their mother tongue. He explains that it violates the learner’s right to an appropriate education and it undermines communication between children, their parents and grandparents.
de Klerk (2002), concluded that parents are “actively and knowingly promoting a shift from isiXhosa to English” in their children (p. 31). de Klerk (2002) conducted her study which focused on views of isiXhosa-speaking parents in Grahamstown in the Eastern Cape, which explored their motivations and experiences in sending their children to English-medium schools. Her study further explains that, “for political, economic and educational reasons, parents want their children to be assimilated into a single unified national culture which will probably be western to the core” (p. 31). However, another study (Burkett et al., 2001) states that if the visibility of isiXhosa is seen as a viable medium for learning and this notion is publicized to parents, teachers and learners, then the attitudes towards learning in an additive bilingual context will change. As Banda (2000) indicates, the problem is how to change the African attitudes towards MT medium of instruction, as research has shown the value of mother tongue instruction (Adler, 2001; Heugh, 2002; Setati, 2003a, 2008).

de Klerk (2002) also describes the parents’ perception of what democratic language rights are. For some, the implications to promote MT instruction may be perceived as a limitation or a restriction to their right to acquire competence in a model of English that has international currency and will afford them the advantages that others, the world over, enjoy. For others, MT instruction implies the need to recognise and “promote the localised languages as equally viable and effective” as any other language (de Klerk, 2002, p. 33).

7. RESEARCH PROBLEM STATEMENT

In SA, it is difficult to prepare neither the FAL English teachers and nor the learners adequately to teach and learn ML using English as the LoLT (DoE, 1997) since neither the teachers nor the learners speak it proficiently. This situation prevails because teachers were under qualified or exposed to poor inferior pre-service training that did not cater for acquiring English competency (Burkett et al., 2001). The purpose of this research was to better understand and interpret the FAL English grade 12 ML learners’ and teachers’ experiences, perceptions, challenges and problems with the teaching in English, in order to be able to draw on good classroom language practices that promote mathematical proficiency for all learners.
Given the newness of the subject, any new research into this subject ML is proven to bridge the language gap between the mathematical content and context with language issues, and to be able to recognize and articulate precisely the context where particular language strategies works and where it fails in bi/multilingual ML classrooms in South Africa (Heugh, 2002).

The poor achievement of FAL learners in mathematics has long been a matter of great concern for all stakeholders in the education process in South Africa (Howie, 2001). Numerous attempts by the government have been made to solve the problem and to re-establish a culture of learning and teaching in the schools. This is evidenced by the constant review of the education system since 1994, viz. National Education Department 550 (NATED 550) (DoE, 1994), Curriculum 2005 (C2005) (DoE, 2003), National Curriculum Statement (DoE, 2006), Revised National Curriculum Statement (RNCS) (DoE, 2008), and more recently Curriculum and Assessment Policy Statement (DBE, 2011). Educators and all stakeholders in the education process throughout the country are eager to engage with any new research, which can determine a new classroom strategy that will help to overcome the lack of proficiency in the FAL English at schools. ML, is a new subject discussed in many mathematics education literature and although many researchers (Christiansen, 2006; Steen, 2001; Venkatakrishnan & Graven, 2006) have delved into this topic, I hope to show that there is a need to investigate further, with the expectation that it may reveal new insights that will further assist educators to achieve a greater awareness of the role of language in learning and teaching in bi/multilingual ML classrooms. Also, more importantly to develop and highlight classroom strategies that actually works in bi/multilingual ML classrooms. In this way, FAL English ML learners acquire both language competency and develop mathematical conceptual understanding so that they learn ML more effectively and enjoy the mathematical content.

The unique nature of the ML curriculum is developed as an interconnected approach where the focus is on both the mathematical content and its context. The emphasis is therefore on both the content and context linked together. Hallett (2003) reported that it is difficult for FAL English learners to identify mathematics in context, and most teachers have no experience with this. Teaching mathematics in real life-
related context thus poses a tremendous challenge. My research will take a closer
look at the FAL English learners’ and teachers’ experiences and perceptions
concerning the use of a first additional language English as a medium of instruction
and also to reveal the various strategies that teachers use as a coping mechanism
to close the language gap that exist in their bi/multilingual ML classrooms.

8. RESEARCH AIMS

The aims of the study are:

- To investigate the experiences and perceptions of the FAL English learners
  in bi/multilingual ML classrooms where the language of learning and teaching
  (LoLT) is English.

- To explore and examine the FAL English teacher’s perceptions and
  experiences of the impact of language in bi/multilingual ML classrooms and
  to reveal their interactions (classroom strategies) within a community of
  practice.

9. RESEARCH OBJECTIVES

In order to address the research aims, the following research objectives were
identified:

- To engage FAL English teachers and learners in dialogue with the researcher
  through interviews in order for the researcher to understand their perceptions
  of their own classroom settings.

- To understand and interpret the experiences and perceptions of FAL English
  teachers and learners in their bi/multilingual ML classrooms.

- To identify the preferred language use of FAL English teachers and learners
  and the reasons thereof when teaching and learning takes place in their
  bi/multilingual ML classroom.
• To probe and bring forth the challenges and problems that FAL English teachers and learners encounter on a daily basis with the LoLT English.

• To elicit and draw on the FAL teachers’ interactions and strategies in their bi/multilingual ML classrooms as a community of practice in order to promote good classroom practice to facilitate optimal teaching and learning.

10. RESEARCH QUESTION

The research question I want to investigate is:

• What are the FAL English teachers’ and learners’ experiences and perceptions concerning the use of English as the LoLT in bi/multilingual ML classrooms?

The research sub-questions that emanate from the research question of this study are:

• What is the language of teaching and learning in bi/multilingual ML classrooms by FAL English teachers and learners and the reasons thereof?

• Do the FAL English teachers and learners feel that they teach and learn ML knowledge and skills better in their home language isiZulu or the LoLT English?

• What interactions (classroom strategies) within a community of practice do teachers and learners experience that indicate successful learning and teaching in bi/multilingual ML classrooms?

11. RESEARCH DESIGN AND METHODOLOGY

This study will use a qualitative research approach. This research approach is flexible, semi-structured, and inductive. In many ways it was also deductive. This approach encourages me to conduct my research so that prior theories are consulted but not excessively relied on, to inform my research approach. The
research participant’s contexts could be different to those that exist in the research literature. In this way, I can be discerning towards unexpected events and findings and also keep an “open mind” to the research problem (Struwig & Stead, 2007, p. 13). I acknowledge that this research study and I are connected and therefore I cannot be completely objective.

11. 1. Sample and Setting

A sample of three ML FAL English teachers and five grade 12 ML FAL English learners were selected from each of the five different secondary schools in the Midlands area in KwaZulu-Natal. Teacher participants were selected based on the appropriate information from the teacher profile form, such as; being a grade 12 FAL English ML teacher. The selected teacher participants were given consent forms and all participation was voluntary. Also from each secondary school, a sample of five grade 12 ML FAL English learners of both genders were chosen, since they have more experiences with the subject ML having progressed through the FET phase. These learners were selected randomly from class marksheets/registers of the teacher participants from the school. This sample is selected for the following reasons: it is easily accessible for the researcher and the costs involved were fairly low.

11. 2. Data Collection

I obtained data by means of semi-structured interviews with all participants – three teachers per school that were involved in the teaching of ML and five grade 12 ML learners per school. I used a colleague from my own school that is proficient in isiZulu to serve as my interpreter/translator during the interviews. I spoke in English and my interpreter communicated my questions to both teacher and learner participants in isiZulu. The participants were requested to use a language that they were comfortable with and my interpreter translated their responses to me in English when it was required. With the permission of the participant, I used an audio recorder during all interviews so that accurate responses could be obtained. During the study, pre-determined questions (see appendices D and E) for the interviews with all participants were presented in an organised and consistent way. I was able
to adapt, develop and generate questions as the interview progressed and the assumption was that I did not know in advance what questions should be asked – the appropriate unstructured questions emerged as the interview progressed to obtain new and useful information (Struwig & Stead, 2007). Each participant was interviewed individually with an interpreter/translator present. During the interviews, I made recordings of my own observations, such as: hand gestures; tone of voice and body language and my on-site experiences.

11. 3. Data analysis procedures

The audio-recorded interviews were transcribed by the researcher in English and then collated and analysed for commonalities and differences. The information from the interviews was grouped into themes by using codes (Macmillan & Schumacher, 2010). During the analysis of the interview transcripts of the participants, a code is linked to a word or a phrase. All of these data from this method, combined, forms an audit trail (Struwig & Stead, 2007). The audit trail permits the interview transcripts, field notes, and coded data to be verified independently by another colleague who has a Masters degree in School Guidance and Counselling. This will ensure that I have made logical connections between the research question, the research goal and the methods selected as most appropriate to my research. This will also ensure the trustworthiness and valid interpretations of the data.

12. ETHICAL CONSIDERATIONS

I obtained ethical clearance from KwaZulu-Natal DBE, NMMU, the concerned schools and participants to proceed with my research. The purpose of the research was explained verbally and in writing to all participants in the research. Participants were also informed prior to the research that all participation was voluntary and they were free to decline or withdraw at any point in the research process. The confidentiality and anonymity of all participants and schools was assured and no personal details were to be disclosed. During the interviews, my interpreter and I attempted to be as neutral as possible in our relationship with the participants. This was done to alleviate any sampling bias and language bias. I obtained permission from all the participants to be audio-recorded during all interviews. Participants were
informed that accurate interview transcripts of the raw data (typed verbatim from audio-recordings) were to be made available after the research process was completed for their comment on its accuracy. Interpretive validity was obtained by asking participants to comment on the interpretations of the researcher (Struwig & Stead, 2007, p. 61).

13. OUTLINE OF THE STUDY

In this chapter, an outline of the background of the study, the LiEP (DoE, 1997), the subject ML, the general language use and attitudes among African parents and learners is described. The research problem is formulated and the aims of the research, the research objectives, questions and sub-questions to be answered in this study are described. The research design and methodology is briefly outlined.

In chapter two, the socio-cultural perspectives of Vygotsky (1978) and Wenger (1998) that guide this research are presented. I also review Cummins’ (2000) quadrants and the relevant literature that highlights issues of bi/multilingualism, code switching and the role of language in bi/multilingual ML classrooms globally and in SA is discussed.

Chapter three presents the research approach. It focuses on the research paradigms of this study, the qualitative research approach methods, the research design, the instruments and strategies of data gathering and the detailed research process used in this study. The treatment of the data, issues pertaining to reliability and validity, researcher reflexivity of this study, as well as ethical issues that guided this process will also be described, discussed and explained.

In chapter four, the process of analysis that guides this study will be illustrated. I report on the qualitative data that were generated from the interviews of both the teachers and learners from the selected secondary schools. The findings and interpretation of these interviews will be discussed as categories and common themes are further examined with its relevance to the literature review.
In the final chapter five, I present the main findings of the study from the categories and themes that were described in chapter four. Some limitations and recommendations will be suggested and conclusions will be drawn.
CHAPTER 2
THEORETICAL FRAMEWORK AND LITERATURE REVIEW

1. INTRODUCTION

Socio-cultural theories of learning provide the framework for examining teaching and learning practices in bi/multilingual ML classrooms in South Africa. According to Forman (2003), socio-cultural theories offer a way forward in understanding the fundamental link between instructional practices and learning outcomes and also show how mathematics learning entails communication in social contexts. It is from this notion that mathematics learning and teaching can be viewed as social and communicative activities that require a community of practice (Lave & Wenger, 1991). The focus of this study is to understand the experiences and perceptions that the FAL English teachers and learners have about the LoLT English in a bi/multilingual ML classroom and describe these interactions in South African communities of practice that have many dimensions of complexity including different linguistic, cultural, social and educational backgrounds (Lave & Wenger, 1991). This chapter draws on the findings of researchers that divide the chapter into four parts (Adler, 2001; Cummins, 1984; Heugh, 2002, 2008; Lave & Wenger, 1991; Setati, 2005a, 2008; Vygotsky, 1962, 1978; Wenger, 1998).

In the first part of this chapter, I will review the model of situated learning as proposed by two researchers - Lave and Wenger (1991). The model of situated learning as defined by Lave and Wenger (1991), proposed that learning involved a process of engagement in a community of practice. In post-apartheid South Africa, communities of practice exist in bi/multilingual classrooms that include learners from diverse cultural backgrounds (Lave & Wenger, 1991). These communities of practice contain a vast source of knowledge that needs to be shared and moulded into meaningful knowledge (Lave & Wenger, 1991). They further elaborate that such communities of practice, where learners speak and act mathematically by participating in mathematical discussion and solving new or unfamiliar problems – could be described as “communities of mathematical inquiry” (Lave & Wenger, 1991).
1991, p. 4). An overview of Lave and Wenger’s (1991) theory of a community of practice will be reviewed to show the benefits of a well organized ML lesson in a South African context.

In the second part of this chapter, I will discuss Vygotsky’s (1978) socio-cultural perspective of his theories, namely, the notion of the zone of proximal development (ZPD), as a framework for explaining learning as increasing interactions in bi/multilingual classrooms characterised by discussion, mediation, scaffolding and collaboration. Vygotsky (1978) argued for the importance of language as both a psychological and cultural tool.

In the third part of this chapter, I will describe Cummins’ quadrants and explore the benefits of Cummins’ notion of language use (Cummins, 1984, 2000). His studies suggest that there are different contexts that require different kinds of language competence (Cummins, 1984). For these chapters, I will link the socio-cultural theories of Wenger’s community of practice and Vygotsky’s zone of proximal development (ZPD) with Cummins’ quadrants to provide a review of the theoretical framework for this study.

In the fourth part of this chapter, I will focus on literature that provides insight into studies about mathematics, bi/multilingual issues in ML classrooms, mother tongue instruction and code switching in South Africa and in other countries around the world.

2. THE DEFINITION OF A COMMUNITY OF PRACTICE

Many teachers and learners themselves are under the impression that learning takes place as an individual. What if learning and our education are more social? Suppose our knowledge comes from our everyday experiences? Wenger (1998) provides us with a theory of knowing and learning often referred to as a community of practice where learning takes place collectively in a shared domain of human endeavour (p. 1). Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly. The teaching and learning of ML in bi/multilingual mathematical
literacy classrooms can be referred to as a community of practice (Lave & Wenger, 1991).

2.1. The three structural characteristics of a community of practice.

According to Wenger, McDermott and Snyder (2002), the three structural characteristics that are crucial to define a community of practice are again redefined: “to a domain of knowledge; a notion of community and a practice” (p. 28). It is a combination and constant interaction of these 3 structural characteristics in parallel that make up a community of practice.

![Parallel representation of Wenger's theory of a “community of practice”](Wenger et al., 2002, p. 28).

Central to Wenger’s theory of a community of practice, is learning. According to Wenger (1998), learning is a process of co-participation within a community and can be described as a regular interactive process where members share a concern for something they do and learn how to do it even better. Wenger (1998) describes communities of practice for learning as informal communities of learning as they are found everywhere. Wenger (1998) highlights that not everything called a community, is a community of practice. A neighbourhood for example, is often referred to as a community but it is not usually a community of practice because it is not a shared practice. In more recent work, Wenger et al., (2002) further elaborates that a “community of practice has an identity defined by a shared domain of interest. In following their interest in their domain, members engage in shared activities and
discussions, helping each other, sharing information and knowledge” (p. 27). For a community of practice to be defined as such, members must interact and learn together. Wenger (1998) points out that a community of practice is not merely a gathering of people with interest or those who have certain likes but they are members that are practitioners. They develop a “shared repertoire of resources: experiences, stories, tools, ways of addressing recurring problems - in short, a shared practice” (Wenger, 1998, p. 14).

While a community of practice has all 3 characteristics of a domain, a community and a practice, they often come in a variety of forms. One main community of practice is involved in this study, viz. the diverse bi/multilingual ML classrooms. The members of this community of practice are the teacher who may be merely peripheral and the learners who may be core members, and the ML curriculum which forms the shared domain of interest that sets the scene for the nature of teaching and learning.

2.2. The ML curriculum as a shared domain of interest.

The structure in the ML classroom as a community of practice refers to the nature of teaching and learning promoted by the Department of Basic Education (DBE). There are four guideline documents (DoE, 2005, 2006, 2008; DBE, 2011) that provide detail and support on how to teach and assess ML. These guideline documents are: the Learning Programme Guidelines (LPG) for ML (DoE, 2005); the Teacher Guide for ML (DoE, 2006) and the Subject Assessment Guidelines for ML (DoE, 2008) and the Curriculum Assessment Policy Statement (DBE, 2011). The LPG for ML (DoE, 2005) appears to follow a connected approach with the content and context; it claims that ML aims to develop four important abilities:

1. The ability to use basic mathematics to solve problems encountered in everyday life and work situations.
2. The ability to understand information represented in mathematical ways.
3. The ability to engage critically with mathematically based arguments encountered in daily life.
4. The ability to communicate mathematically. (p. 8)
These aims clearly outline the relationship that exist between the domain and the community as described by Wenger (1998), that all learning should occur as an identity that gives meaning to actions. ML learning involves the acquisition of knowledge that is required to the understanding, engagement and communication of mathematics in the everyday life and the work environment of ordinary individuals.

The Teacher Guide for ML (DoE, 2006) describes the role of the ML teacher with respect to the relationship between context and mathematics as follows:

The challenge for you as the teacher is to use situations or contexts to reveal the underlying mathematics while simultaneously using the mathematics to make sense of the situations or contexts and in so doing develop in your students the habits or attributes of a mathematically literate person. (p. 4)

The curriculum guideline (DoE, 2003a) “that teachers engage with context rather than applying mathematics already learned to the context”, shows a preference for the focus on the context when compared with the application of mathematics using the context as vehicle orientation (p. 42). Furthermore, according to the Teacher Guide (DoE, 2006) the role of the ML teacher is “to use situations or contexts to reveal the underlying mathematics while simultaneously using the mathematics to make sense of the situations” (p. 4).

The SAG document (DoE, 2008) appears to follow an integrated approach where the focus is both on the context and the mathematical content when it states: “On the one hand, mathematical content is needed to make sense of real life contexts; on the other hand, contexts determine the content that is needed” (p. 7). Furthermore, the LPG (DoE, 2005) prescribe that ML should be presented within an authentic context: “The subject … must provide authentic opportunities for the learners to work towards achieving critical outcomes” (p. 11).

However, the NCS and its numerous documents (DoE, 2003a, 2005, 2006, 2008) came under review. The NCS (DoE, 2003a) conveyed too many mixed messages between the contextual teaching approach and the mathematically organized ML curriculum. These mixed messages, which were open to the interpretation of the ML teachers, suggested that the agendas with a contextual focus are preferable to
some while the agendas with a mathematical content focus were not and vice versa. Overall then, the preferred approach appeared to be the choice of the ML teachers. The selection of the appropriate mathematical content to solve the contextual problem might vary from person to person since there might be more than one way to approach a particular situation. Further, the mathematical calculations should be linked back to the context and inform the context. Teachers need to have both, a sound mathematical knowledge and an understanding of the contexts to teach ML in line with curriculum aims. After much deliberation from all education stakeholders, a new curriculum policy was envisaged namely, the Curriculum and Assessment Policy Statement (DBE, 2011). With the new curriculum guidelines CAPS (DBE, 2011), emphasis was now placed on progression in ML, which occurs on three levels: content; contexts and confidence in solving problems. The five key elements of ML in the CAPS documents (DBE, 2011) are:

1. It involves the use of elementary mathematical content.
2. It involves authentic real-life contexts.
3. It involves solving familiar and unfamiliar problems.
4. It involves decision making and communication.
5. It involves the use of integrated content and/or skills solving problems. (p. 9)

What does it mean to work with the three levels of ML, content, contexts and confidence, and its five key elements? What role does language play in the knowing of the three levels? Setati (2005a) explains that in the relationship between language and mathematics, language serves as a medium through which mathematical ideas are expressed and shared. Lerman (2001) also describes that language plays an important role in the genesis, acquisition, communication, formulation and justification of mathematical knowledge and knowledge in general. The ML curriculum as CAPS (DBE, 2011) at first glance does not show much difference to the NCS (DoE, 2005). However, on closer inspection, it reveals a new approach to the curriculum that forms part of a community of practice.

The key characteristic of the ML curriculum (DBE, 2011) is the “progression that occurs to the nature, familiarity and complexities of the context in which problems are encountered” (p. 12). The emphasis of the teacher being the facilitator as well as the learners being the core members remain, but the curriculum, moving from
grade 10 to grade 12 now emphasises the content (concepts and skills); the appropriate context (as they become less familiar, less accessible and more demanding) and the confidence in solving problems in ML, to be presented as mathematical topics and the suggested context to be used is clearly outlined (DBE, 2011). So, the ML curriculum as it was implemented as the NCS (DoE, 2005) or is currently implemented with its new approaches as the CAPS (DBE, 2011), the role of language is increasingly foregrounded, thus, it continues to bring new pedagogic challenges.

2.3. Use of the ML policies in creation of environments in the classroom

Wenger's (1998) work mainly focused on the 3 structural characteristics that identify a “community of practice”. Figure 2 shows how these characteristics in a ML classroom are interconnected by a triangle.

Figure 2: Representation of the three identifying structural characteristics of a “community of practice” as it can occur with a ML curriculum.

The theories of domain refer to the actual practical experience of teaching and learning of teachers and learners in ML classrooms. The focus is on the meaning of ML and the opportunities that a teacher creates during the teaching practice
including planning, facilitation and assessment. The teacher as the facilitator who takes the role of being peripheral, embarks on teaching strategies that promote group interactions in various ways on numerous levels. The teacher can provide the necessary support in bi/multilingual ML classrooms with the necessary classroom language practice which integrates the theory of identity. Teachers need to have a sound mathematical knowledge and an understanding of the contexts to teach ML in line with curriculum aims, in a language which is generally not their home language. Wenger’s (1998) theories of social practice emphasize “social systems of shared resources”, such as textbooks (p. 13). In South Africa, the shared resources such as textbooks, the prescribed policy documents and assessments appear in the LoLT English only, except for the African languages as subjects themselves (Foley, 2007). The ML teachers draw largely on the shared resources offered by the Department of Basic Education (DoE, 2003a, 2005, 2006; DBE, 2011) and develop meaning to the way of teaching and the learning of ML. Perhaps one the most important aspects for a teacher to consider is following all of the prescribed documents namely, Curriculum 2005 (DoE, 2003a, 2005, 2006), NCS (DoE, 2008) and CAPS (DBE, 2011) or actual committed action within a community of practice. Teachers should have the necessary knowledge and skills to genuinely create environments that are conducive to the teaching and learning of ML in bi/multilingual classrooms.

Theories of identity focus on “social development of a person, the creation of community membership and the development of social categories” (Wenger, 1998, p. 13). In a ML classroom, this membership involves the language practices and the ways of teaching the ML curriculum that becomes linked to the interaction of the ML learners as a group. Rogoff, Turkanis and Bartlett (2001) suggest that teachers should prioritise instruction that builds on children's interests in a collaborative way. Schools also need to be places where “learning activities are planned by children and adults, and where parents and teachers not only foster children's learning but also learn from their own involvement with children” (Rogoff, Turkanis & Bartlett, 2001, p. 3). According to Fairclough (1995), institutions impose upon individuals their ways of thinking and seeing. In this study, this means that the multilingual/cultural classrooms impose particular identities which shape and are shaped by individuals as they enact them.
The triangle in figure 2 is a symbolic representation of the stages of development as shown in figure 3. The circle of identity from figure 2 could portray the potential and coalescing stage of development as illustrated in figure 3, where learners will come together to share their knowledge and thus create a community of practice. The learners will come together and explore the classroom activities and tasks. They will be involved with each other’s knowledge, experiences and stories.

The circle of domain and meaning from figure 2 refers to the active stage of development as shown in figure 3. The activities and tasks within the classroom environment should be carefully planned by the teacher who takes the role as a facilitator to provide meaningful opportunities for the learners to engage in the relationships and understanding of the knowledge content.

The circle of social practice emphasises the social systems of shared resources, with the aid of the department policies, documents and textbooks, the community of practice could be developed into a centre of knowledge.
Figure 3 has been cited and adapted from E. Wenger (1998), to show that a community of practice can move through various stages of development characterised by the different levels of interaction among members and different kinds of activities. However, it should be noted that the domain and meaning, the identity and the social practice is not confined to the ML classroom only. The process of teaching and learning is an ongoing process as illustrated by the dispersed and memorable stages.

3. VYGOTSKY’S UNDERSTANDING OF COGNITIVE DEVELOPMENT

Vygotsky’s (1978) thinking has particular relevance to us in South Africa today, because we are going through a period of ongoing curriculum transformation and there is an urgent need to overcome high levels of illiteracy and innumeracy amongst our people. The central themes of his theories offer all education
stakeholders an insight on the impact of rapid social change on cognition and the impact of schooling on non-literate people, as well as to better understand human development and developmental psychology.

3. 1. The Social Construction of Learning

Vygotsky (1978) believed that learning does not just happen inside a child’s head; it is strongly influenced by social interactions. Vygotsky’s (1978) approach highlights the importance of the socio-cultural aspect in learning. He believed that any learning process occurs first between people before it is represented cognitively within the child. The important point is that social processes and interactions in the environment are transformed to become internal processes within the child (Vygotsky, 1978). According to Cummins (2000), learning involves becoming enculturated in which a learner finds that learning is marked by the use of conceptual tools like language. When there is interaction among parents and their children, their interactions are influenced by culture and language. At home, the manner in which a family may cook a meal, greet people or even entertain at a social gathering, are guided by cultural habits from one generation into the next. Also, humans take on different roles. In the process of growing up at home, adult humans guide the children in appropriate use of physical tools; such as using a pen, and psychological tools; such as using language. Thus, the surrounding culture is very influential in shaping human interactions. This is the knowledge that learners possess and bring with them to engage with the formal learning at school. It is through this knowledge that formal learning is built on and should not be seen as separate entities. According to Mercer and Littleton (2007) Vygotsky’s proposal describes that children’s intellectual development is shaped by the acquisition of language and makes communication possible between learner and parent, learner and learner and learner and teacher which occurs through different languages.

It can be summarised from the above paragraph that the assistance given to a child by someone with more experiences, helps the child to learn. Vygotsky (1978) perceived teaching as ‘assisted performance’. The role of a teacher is to assist the learner to improve their use of both psychological (in this study language is viewed as the psychological tool as well) and physical tools so that the learner can perform
better in tasks appropriate to the learner's age level. From a Vygotskian (1978) perspective, teaching is often called mediation. This perspective moves away from a 'teacher-tell' approach. This approach enables the teacher to assist a learner/s through step-by-step guidance, explanation, demonstration, questioning, probing and feedback. Mediation allows learners to interact between learner and learner, and teacher and learner in a language that they are comfortable with and confident in, thus learners are able to acquire, assimilate and process new knowledge. Vygotsky (1978) emphasises the importance of social interaction in the process of learning.

3.2. Internalisation – From Speaking to thinking

Vygotsky (1962) describes his observation of young children at play. He observed that children often talk to themselves as they engage in activities of playfulness. He (Vygotsky, 1962) referred to this as egocentric speech. As the child matures, he/she verbalises less (sentences become shorter) and is involved in more silent talking. This transition from talking aloud to silent talking is described by Vygotsky (1962) as the internalising of words so that they become thoughts. Vygotsky (1978) cements this theory further as he refers to the internalisation of psychological functions: “we call the internal reconstruction of an external operation internalisation” (p. 56). The development occurs when a maturing child is able to make coherent links about ideas and thoughts gathered during his interactions with others. This action of talking aloud gradually disappears and the maturing child is thinking.

Vygotsky (1962) describes this developmental process as a shift from external egocentric speech to internalised inner speech. In the case of SA, FAL English learners experience this shift when their formal learning takes place in LoLT English and a translation internally into their home language. Furthermore, Vygotsky (1962) observed that an explanation of one's thoughts becomes difficult as we try to verbalise them into sentences. This is a reality for many teachers as learners struggle to find the words to provide an explanation of knowledge that is clearly understood. Vygotsky (1962) concluded that inner speech is: “a distinct plane of verbal thought … the translation from inner speech to external speech is not a
simple translation … It is a complex, dynamic process involving the transformation … of inner speech into … speech intelligible to others” (p. 148).

Vygotsky (1962) emphasised the need for learners to have a great deal of opportunity to be able to translate and verbalise their thoughts into speech. As teachers, we have to think about the various strategies that we can use to encourage the expansion and exploration of ideas in our classrooms. Teachers need to plan and prepare appropriate classroom activities to provide opportunities for our learners to talk about their learning.

In this study, the understanding and experience of the ML curriculum as meaningful by the teacher will lead to the establishment of a classroom practice (Wenger, 1998). Learners should be encouraged to reflect on and thus think about their own thinking. Although learners may be exposed to the same learning experiences, not all of them will learn in the same way at the same time, this means that the thoughts they construct will differ as individuals. The way in which learners construct thoughts or ideas is determined by the learners’ pre-knowledge which influences what they will eventually choose to remember as an experience. The key point that Vygotsky (1978) argues is that the child’s developmental process is the transition from dependency on guidance and discussion with others to being more self-sufficient or independent. Vygotsky’s ideas are echoed in the CAPS document which highlights the progression of content and context from familiar to unfamiliar (DBE, 2011).

In the context of the research, the learning component of meaning was sought in terms of the teacher’s understanding and experience of the ML curriculum as meaningful, as well as ways of teaching the curriculum (Wenger, 1998). Within a South African ML classroom, some teachers want the children to use English when explaining their mathematical reasoning because the teachers feel that if these learners are denied the chance of becoming fluent in English, which is an international language, then they may not be able to participate with other people outside the classroom setting (Setati, 2005a). The question is: how will the learners communicate their mathematical reasoning or any other social interaction in a language they do not understand? Within the bi/multilingual ML classroom, the language which the learner understands best should be used to help the learner
access the knowledge being taught and also the learner should use that language when communicating his mathematical knowledge, especially to become self-sufficient citizens in the real world, as the aims and objectives of the CAPS (DBE, 2011) prescribe. Prior researchers (Adler, 2001; Setati & Adler, 2001) have described that some teachers are faced with dilemmas of deciding when the learners should be given an opportunity to use the languages which they understand best as linguistic capital. In this study, my research focus is to elicit and understand the FAL English teachers’ and learners’ experiences and perceptions with teaching and learning in the LoLT English in order to identify and reveal the cognitive challenges associated with the LoLT English in ML education. The aims and objectives of this study are aligned to reveal the interactions (strategies) and relationships that are encountered by FAL English teachers with the LoLT English in bi/multilingual ML classrooms. In this way the results of this study can show the link between the literature and the research itself.

3. 3. Spontaneous vs. Schooled Concepts

One of the central themes that Vygotsky (1978) emphasises is the differences between the knowledge and habits that children learn before they go to school or outside of school and the manner in which learning is structured at school. Children learn informally prior to schooling by engaging in their everyday routine lives, such as bathing themselves, running and playing with a ball, and learning their home language. Their learning is incidental, and it is not planned in any way. Vygotsky (1978) referred to this type of learning as spontaneous learning and for FAL English learners in SA, this learning takes place in an African home language. The child’s interactions with their parents and family members allow them to gather a large amount of knowledge. The acquisition of this knowledge comes from the cultural heritage and the home language and is passed from generation to generation. Our culture is our source of knowledge. A child takes this spontaneous knowledge to school.

However, once children enter the portals of formal education, they are exposed to a series of pre-planned learning activities which are influenced by knowledge that already exists. The knowledge that is learnt at school is arranged according to a
system which is guided by rules, regulations and policies. Vygotsky (1978) referred to this type of learning as scientific and for the FAL English learners in SA, this learning takes place in English as the LoLT. Vygotsky (1962) explains that “the developments of spontaneous and non-spontaneous concepts are related and constantly influence each other” (p. 85). Vygotsky (1962) refers to the importance of school, “instruction is one of the principal sources of knowledge” (p. 108). One of the main reasons of schools is to enable a child to become knowledgeable about the volumes of information gathered by previous generations. At school, the child is exposed to this formal scientific knowledge, in a language that is not their home language, thus, the child has to fill in the gaps and make the link with his spontaneous knowledge that has already developed. Within ML bi/multilingual classrooms as communities of practice, an identity is defined by a shared domain of interest (Wenger, 1998). The teacher and formal schooling (curriculum) can bridge that language gap that exists by carefully deciding what language skills and mathematical knowledge should be passed to learners and at what age the learner should acquire the language skills and mathematical knowledge.

3. 4. The Zone of Proximal Development

In his book *Thinking and Speaking*, Vygotsky (1962) observed that when learners work by themselves, they are able to reach a certain level of problem-solving, but when they are assisted by a more knowledgeable other, then they are able to reach a higher level in problem-solving. Vygotsky (1962) first describes the zone of proximal development (ZPD) as “the discrepancy between a child’s actual mental age and the level he reaches in solving problems with assistance indicates the zone of proximal development” (p. 103). In a later publication he (Vygotsky, 1978), defines the ZPD as “The distance between the actual developmental levels as determined by independent problem solving and the level and potential development as determined by problem solving under adult guidance or in collaboration with more capable peers” (p. 78).
The idea of the ZPD is illustrated in the Figure 4 below:

![Diagram of ZPD](image)

**Figure 4: The design of a ZPD (Vygotsky, 1962).**

In this study, the ZPD is shown as the difference between a learner’s actual and potential levels of any given activity/task within a bi/multilingual ML learner. This research is necessary to identify whether FAL English teachers knowingly or unknowingly embrace the perceptions of mediation, scaffolding, collaborative learning, modelling activities, probing learners, giving encouragement, providing opportunities for learners to speak about their thoughts and learners’ experiences with class activities/tasks in their bi/multilingual ML classrooms where the LoLT is English. During the individual interviews with participants, teachers’ perceptions and experiences were explored to reveal their teaching strategies such as code switching, revoicing, and discussions that provided support to the LoLT English.

Vygotsky (1978) emphasises that all good teaching takes place in the learners’ ZPD. He identified several ways that a teacher can do this; modelling activities (doing a demonstration of something so that learners can imitate the teacher), giving encouragement and praise for small gains, and involving and probing learners to speak about their thoughts. Vygotsky (1978) referred to this as mediation. He further
explains that through the mediation process (the process of interaction between children and adults) learners learn how to memorise new information.

According to Setati (2005a) for learners to successfully reason mathematically they need to communicate in their main languages; however, to meet their aspirations in the workplace they need to learn the discourse of mathematics - the ways of talking about mathematics, listening to mathematics, acting in a mathematics class or in the community, interacting mathematically, believing, valuing and using mathematics. This development can only take place through the conscious guidance of the teacher, who is the mediator of learning and fosters the development of a community of practice in a classroom (Mercer & Littleton, 2007). Thus teachers can use classroom activities and discussion to develop ZPDs with learners, and among learners. This study proposes to identify the perceived types of classroom activities and forms of discussion (strategies) that FAL English teachers would use to model the mathematical terms and concepts that would develop, guide and provide feedback to the learner especially with the new mathematical words, sentences and dialogue that may have been introduced in English.

Another significant Vygotskian theory in the 1970s that is described by Mercer (1995) is the metaphor of scaffolding to elaborate on the role of teacher by providing temporary support to enable children to successfully engage with learning on their own at their level of competence elicit and describe the experiences of the FAL English teachers’ with the intention to reveal good classroom practices. This term, scaffolding, comes from the building industry, where a builder will use wooden boards to create a platform in a ladder-like structure to help him to reach higher up as he builds a wall. When the building is completed, wooden boards (scaffolds) are removed. On a cognitive level, scaffolding refers to the support provided by the teacher (words of instruction, worksheets, or explanations) to enable a learner to accomplish their activities with success independently, at their level of proficiency. In the case of a FAL English learner in SA, this strategy mainly occurs by code switching. Setati (2005a) mentions that in classrooms where learners are taught in a language that is not their home language then code switching practices are possible to support classroom communication in general while learners continue to develop proficiency in the LoLT English.
According to Setati (2005a) “part of learning mathematics is acquiring fluency in the language of mathematics, which includes words; phrases; symbols; abbreviations; and ways of speaking, writing, and arguing that are specific to mathematics” (p. 448). Learning to communicate mathematically is the key to many researchers (Adler, 2001; Moschkovich, 1996, 1999), the NCS (DoE, 2001), and CAPS (DoE, 2011). This focal point of communicating mathematically encourages the very essence of Vygotsky’s (1978) theory on the importance of social interaction in the process of learning. The LiEP (DoE, 1997) promotes multilingualism but teachers have to plan appropriate strategies to encourage multilingualism and engage the learners in collaborative talk to communicate mathematically.

Setati (2005a) reports on other researchers’ (Adler, 2001; Moschkovich, 1996, 1999; Setati & Adler, 2001; Setati et al., 2002), findings that “mathematics education in bi/multilingual classrooms has argued for the use of the learners’ home language(s) as resources for learning and teaching mathematics” (p. 448). The central idea was two-fold: to promote the use of the learner’s home language in the classroom to act as a support (Vygotsky’s scaffolding and ZPD) so as to develop proficiency in the LoLT (English) as well as the learning of mathematics. Setati (2005a) points out that those studies are framed by a conception of mediated learning, wherein language is seen as a tool for thinking and communicating. Vygotsky’s (1978) concept of mediation emphasises that in order for learners to acquire fluency, there have to be interactions whereby an experienced learner can share his/her knowledge with a less advanced learner in whatever language they are most fluent, comfortable or able.

3.5. Collaborative Learning

The learners also have a very important role to play in their own learning, which emanates from their interaction with each other. Vygotsky (1978) observes that assistance in the ZDP may occur under adult supervision or “in collaboration with more capable peers” because their level of understanding is closer to each others (p. 86). Therefore to put Vygotsky’s theory into practice, this study explores the opportunities (strategies) that are provided by the FAL English teachers for their learners to reflect on and talk in a preferred language about their learning
experiences. It is valuable for learners to try out their ideas with their classmates first when they are solving problems, before expecting them to speak to the whole class. Bruffee (1993) says the following “a group that includes diverse experience, talent and ability, people’s ZPD overlap. I may already know a good deal more as a member of a working group than I would be ready to understand by myself alone” (p. 39).

In agreement with Vygotsky on collaborative learning (also termed cooperative learning), Bruffee’s (1993) extensive research on the learning of diverse university students in the USA revealed that when the students worked and studied in groups, they were able to perform better at assessment tasks than those students who worked alone. The research by Forman and McPhail (1993) was carried out in an Australian secondary school that aimed to examine the teacher’s role in creating a classroom culture of inquiry and investigated the patterns of discourse that mediated mathematical reasoning. Such studies are especially useful in the South African context because of the multicultural classrooms that exist (Bruffee, 1993; Forman & McPhail, 1993).

Goos, Galbraith and Renshaw (2002) focused their article on the same aim as Forman and McPhail (1993) about examining discourse and reasoning within small groups of students but they expanded their research by addressing the question of how the teacher initiated students into mathematical practice. These two studies reverberate to the same socio-cultural themes as Vygotsky (1978) and Wenger (1998). South African learners who learn through the medium of English, in their first additional language find it difficult to learn in isolation. However, if teachers create their bi/multilingual community of practice strategically to support the potential level of functioning of a learner through activities involving group work using their home language(s), then this interaction reinforces the belief that the majority of learners can learn and succeed.

However, in Webb (2010), there was evidence that some learners sat in groups, but did not communicate with each other. Alexander (2004) and Dawes and Sams (2004, as cited in Webb, 2010) elaborate that if learners sit together it does not mean they make meaning together. According to Mercer and Littleton (2007), the
learners kept their focus on the educator and did not seem to be engaged in a coordinated, continuing attempt to solve a problem or, in some other way, construct common knowledge. The construct that overarches this study is to explore and investigate the teachers’ perceptions about teaching mathematics in multilingual ML classes. The research design with semi-structured interviews was aimed at uncovering the teachers’ worldviews about limitations, solutions and their own identities that impact on teaching and learning in bi/multilingual ML classrooms (Wenger, 1998).

“What the child can do in co-operation today he can do alone tomorrow” (Vygotsky, 1962, p. 86). The basis of Vygotsky’s theory (1978) on collaborative learning explains a set of instructional strategies in which learners work in small groups to help each other learn. He (Vygotsky, 1978) emphasises that schools and teachers should make cooperative learning a fundamental part of their instruction. In a South African classroom, the bigger picture includes the learners using their home language to interact and the teacher embracing bi/multilingual teaching. This is supported by the LiEP (DoE, 1997) in which the underlying principle is to maintain the use of home language as the LoLT (especially in the early years of learning), while providing access to an additional language(s) (DoE, 1997, p. 6). Unlike the conventional methods of teaching (teacher presents the information) the role of the teacher now is to facilitate the learning and the learners take full responsibility for their own learning. In order for teachers to be successful in a cooperative group work activity, it requires careful planning and preparation, the teacher moving between the groups, and when to use language as a tool to ensure that learners are on task, and understand the activities (DBE, 2011).

4. CUMMIN’S QUADRANTS

In South Africa, learners need to engage with the curriculum and its resources, and be assessed through the medium of English (LoLT). Burkett, Clegg, Landon, Reilly and Versters (2001) say the following:
This means that they will have to learn the variety of language … this is a form of language for academic purposes which enables learners to use the concepts to engage in cognitive strategies and to employ the study skills which constitute school learning. (p. 152)

According to Burkett et al. (2001), in SA the majority of learners have to engage in learning that promotes bi/multilingualism because the context of post apartheid SA portrays a diverse culture with a new democracy in place emphasising pluralism, reconciliation and the extension of powers of decision making being devolved to the local level (DoE, 1997). In SA this is evidenced by the broad scope of the LiEP (DoE, 1997) that recognises all 11 official languages to raise the competencies of learners to a standard required for a developing country and to the transformation and the upliftment of socio-political and socio-economic conditions in order to overcome the historical barrier of apartheid.

The way in which teachers and learners use language influences the core of learning. Cummins (1984) describes language use through his quadrants, as illustrated in Figure 5. Cummins (1984) suggested that there are different contexts in which different kinds of language proficiencies exist. Basic interpersonal communication skills (BICS – bottom left hand quadrant) occur from everyday real-life interactions such as, the playground, at the movies or at a party. Such situations are less formal and more personal in nature; therefore the interactions do not require complex higher-order thinking and is therefore cognitively undemanding. Learners are able to interact comfortably in these situations with friends and family members. According to Cummins (1984) BICS get much support for meaning from the context such as body language, facial expressions, rephrasing and tone of voice.
Cognitive academic language proficiency (CALP- upper right hand quadrant) occurs in a formal situation such as a classroom or other academic setting. In this situation the content is more abstract and unfamiliar to learners. Cummins (1984) emphasises that the language itself in the content carry all the meaning and there are less clues within the context. The learner cannot make meaning of the question because the language is unfamiliar, abstract and to think at that level becomes difficult. The abstract terms presented in the content or question is not part of the learners’ everyday life (to compound the problem more – the abstract terms are in the learners first additional language – English), they have to use their knowledge from their background to make connections with the content.

Cummins (1984) points out that it takes about 1-2 years of learning English to develop and learn BICS. However, even under the most advantageous support for learning, CALP may take a child 7-9 years to learn. The basis of Cummins (1984) research indicates that even with the 2 years of full exposure to the learning of English at school, children who may sound fluent in English may not necessarily be proficient with academic literacy. Cummins (1984) believes that such a learner still
requires the support of their mother tongue to engage with the learning of content and new concepts while they are learning English.

5. MATHEMATICAL LITERACY IN BI/MULTILINGUAL CLASSROOMS IN SOUTH AFRICA

A major issue that has been debated was the nature of a curriculum for ML. The NCS for ML (DoE, 2003a) defines ML as “life-related applications of mathematics” (p. 9), but Christiansen (2006) states that the learning outcomes and assessment standards which describe the core of the subject have been described as “distinctly mathematical” (p. 10). Hence, the NCS (DoE, 2003a) came under review again and with the most recent development, being CAPS (DBE, 2011) as part of the curriculum, the ML curriculum specifics on topics for the content and context have been clearly outlined with the emphasis now placed on progression through the grades. (DoE, 2003a; DBE, 2011)

Brombacher (2007) says the following:

I claim that the purpose of the mathematics we teach in the mathematical literacy classroom – the mathematical knowledge and skills (content) is to help us to solve problems. While we may teach certain content in a mathematics classroom so that the student can use this to develop or learn further mathematics, … reason for learning mathematical content in the mathematical literacy classroom is to enable us to solve problems that we want to solve … (p. 14)

Brombacher’s claim is helpful in the explanation of what the basis of the ML curriculum entails (Brombacher, 2007). This is represented by Figure 6 on the next page.
The aspect of the inter-related nature of the ML curriculum is clearly exemplified by Brombacher (2007). The problems of the ML classroom need to be relevant, interesting and accessible to the students taking the course. As much as the role of the mathematical content is to help us to solve the problems we want to solve, so the problems themselves – the context – plays a critical role in giving meaning to the mathematics we learn (Brombacher, 2007). The purpose of ML is to equip learners with the necessary knowledge and skills to be able to solve problems in any context that they may encounter in daily life and in the workplace, irrespective of whether the context is specifically relevant to their lives or whether the context is familiar (DBE, 2011).

What does it mean to teach and learn in the ML classroom where majority of the teachers and the learners are bi/multilingual? Such is the situation in SA, where English as the LoLT is heard, verbalised to an extent, read and written in the formal school setting only. The issues about language and learning, and language and mathematics cannot be seen as separate entities. Many studies have revealed that there is convincing evidence around the world of the positive effects on learner achievement of promoting bilingualism in education (Burkett, et al., 2001, Heugh, 2002). Research is very clear about the consequences of renouncing a child’s allegiance to his/her mother tongue (Cummins, 2000). He elaborates that strict educational policies violate the child’s right to an appropriate education and
undermines communication between the child and the parent. Heugh (2002) in agreement with Cummins (1984) describes that bilingual education for each child within a multi-lingual educational policy does not mean a choice between either English or an African language, it means both.

The Thomas and Collier study (2002) on education in the United States of America (USA) included full mother tongue instruction programmes. Across all the models, those students who reached the highest levels of both bilingualism and school achievement were the ones where the children's mother tongue was the main medium of instruction. Thomas and Collier state (2002), “The strongest predictor of L2 (second language) student achievement is the amount of formal L1 (first language or mother tongue) schooling. The more L1 grade-level schooling, the higher L2 achievement was obtained” (p. 7). In this study the worst results were with students in regular programmes where the students’ mother tongues were either not supported at all or where they only had some mother tongue instruction. Their learning was mainly done in English, a language that is not the mother tongue of the students. There are several studies (Moschkovich, 1996, 1999) from all over the world that show similar related results. The results of such studies (Moschkovich, 1996, 1999; Thomas & Collier study, 2002) may be useful to our context in SA since our school programmes are not supported by a strongly implemented mother tongue instruction policy.

Due to the contextual nature of ML, it is crucial that language literacy skills such as reading, writing, speaking, comprehension and analysis be applied with the least hindrance. Since language is an integral part of the application of these skills, learning should take place in a language that the child is proficient in, hence enabling the child to clearly understand the mathematical context (Setati & Adler, 2001). It is therefore evident, that the learning that takes place in the child’s mother tongue will lead to greater achievement whilst neglecting mother tongue instruction will lead to poor achievement (Foley, 2007).
6. MOTHER TONGUE INSTRUCTION AND ISSUES OF BI/MULTILINGUALISM

The work of Cummins (1998) and others (Setati & Adler, 2001; Heugh, 2002) in Africa, over the last twenty years has shown conclusively that neglect of the mother tongue could be one of the primary causes of poor results, high dropout rates and general academic underachievement of FAL English students. Cummins (1998) asserts that there are now numerous studies reporting “a positive association between additive bilingualism, involving maintenance and continued development of the mother tongue, and students’ linguistic, cognitive, or academic growth” (p. 3). Literacy skills such as reading and writing are best acquired through the medium of the mother tongue and if this process is disrupted at an early stage, while children are still learning the mechanics of their native language, they may never be adequately developed (Foley, 2007). These skills transfer relatively easily to FAL English, so that, in fact, proficiency in the LoLT English is in no way prejudiced by the continued development or greater allocation of time to the home language.

It has been shown by Cummins (1998) that in a number of contexts the FAL English skills of children in bi/multilingual programmes equal or exceed those of children taught through the FAL English, in spite of the amount of time spent using the FAL English (Cummins, 1998). Several other studies (Macdonald, 1991; Heugh, 2000) show similar results which shows that students who were switched from first language medium (Setswana) to English medium at the beginning of Grade 5 were not able to cope with the linguistic requirements of the system at that point.

Research done by Macdonald (1991) addressed the nature of language and learning difficulties of young African learners in South African Primary Schools. The mastering of complex, abstract or academic concepts in an inadequately known FAL English is always problematic, but, once mastered in the mother tongue, both concepts and vital cognitive skills could transfer readily and could be available for use in intellectually demanding contexts. Academic contexts are far more demanding than the more concrete, contextually supported circumstances in which everyday conversations take place, and the degree and type of skill required are very different. Language specialists, Herbert and Bailey (2002), say that academic English is from such a different foundation than the indigenous languages that there
is no transfer especially in the fields of science and technology. Foley (2007) explains that if the indigenous African languages are to be implemented as academic languages of learning and teaching, the standard written forms need to be “modernised, regularised, codified and elaborated” (p. 2). Webb, Deumert and Lepota (2005) report that projects have been initiated by Pan South African Language Board (PanSALB) aimed at orthographic standardisation; lexicography and terminology development; and the promotion of literature in the indigenous languages. However, progress has not been rapid and a great deal more needs to be completed if the ideal of the African languages functioning fully as academic and scientific media of instruction in SA is to be actualised (Foley, 2007).

According to Setati and Barwell (2006), a classroom can be identified as bi/multilingual when there is more than one language in the process of carrying out activities in the classroom. Such is the case in SA, where the majority of the learners are exposed to bi/multilingual ML classrooms. Heugh (2002) provides examples of bilingualism models: The additive bilingual education model: the objective is the use of mother tongue as a medium of instruction throughout, with the official language taught at school or use mother tongue and official language as two media of instruction. The target is a high level of mother tongue plus a high level of proficiency in the official language.

In South Africa, the LiEP (DoE, 1997) promotes the principle of additive bilingualism which involves the maintenance of home language and access to an additional language. However, in practice English as LoLT continues to dominate in South African bi/multilingual classrooms, despite a progressive Language-in-Education Policy (de Klerk, 2002). In bi/multilingual classrooms the movement from formal spoken language to formal written language is complicated by the fact that the learners informal spoken language is typically in a language that is not the LoLT (Setati & Adler, 2001). Setati and Barwell (2006) highlights that by teachers having to draw on more than one language to engage the learners with activities, then in such classrooms, language diversity cannot be viewed as an asset, because it carries all the challenges that FAL English teachers and learners are faced with. Hence, the need for practices like code switching becomes imperative.
7. CODE SWITCHING

Setati, Adler, Reed and Bapoo (2002) describe code switching as a strategy for teaching and learning in multilingual classrooms which entails alternatives of language within a single conversation. In other research by Setati (2005b) she reveals that teachers use code switching extensively in their multicultural classrooms but they feel guilty because they feel that they are denying the learners an opportunity to acquire English fluency. Adler (2001) described this as the dilemma of code switching. Many FAL English teachers are unaware of their act of code switching as it comes naturally to them. In this study the strategy of code switching is regarded as the practice of using the LoLT English and the home language isiZulu in a ML classroom in a single utterance. The experiences of the FAL English teachers and learners will be investigated to elicit when and how they use code switching in their ML classrooms.

Researchers (Setati, 2005; Rose & van Dulm, 2006) report that in classrooms where English second language speakers are taught in English, code switching practices are likely to happen. Their research shows that code switching fulfils a purpose of clarifying, confirming and the expansion of ideas in classrooms which may aid teachers and learners in attaining their academic goals. Rose and van Dulm (2006) in agreement with Setati (2005) concluded that code switching can be used as a communicative tool in learning and it can provide an additional resource in multilingual classrooms. The findings of Rose and van Dulm (2006) also reported that switching between learners’ home language and the language of instruction by both teachers and learners enhances the quality of mathematical interactions in the classroom. The purpose of the semi-structured interviews is to probe why teachers preferred a certain language practice to support classroom dialogue and which language (English or isiZulu or both) they preferred to teach ML and to engage learners in classroom interactions.

8. CHAPTER SUMMARY

In this chapter, I have presented the theoretical framework that informed the study. The theoretical framework highlights Wenger’s (1998) theory of a community of
practice to show the benefits of a well organised ML lesson in a South African context. I also reviewed the socio-cultural perspectives of Vygotsky (1978) on the social construction of learning; internalisation – from speaking to thinking; spontaneous vs. schooled concepts; the ZPD and collaborative learning. I examined Cummins’ (1984) quadrants and explored the benefits of Cummins’ notion of language use. I have also explored some issues of bi/multilingualism in ML classrooms, mother tongue instruction and code switching. The next chapter presents the research design and the methodology used in this study.
CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

1. INTRODUCTION

In this chapter I will discuss the research design and methodology of this study. Research paradigms that are relevant to this research study are described. The qualitative research method as a single method of data collection is motivated and the sample and the reasons for the sample are described. The data collecting instrument is reviewed in relation to the research question. The trustworthiness and credibility of the data instrument, reflexivity and ethical considerations are also portrayed.

2. THE RESEARCH QUESTION

As noted in chapter 1, there are many problems associated with mathematics education in South Africa, and one key area linked with poor achievement in mathematics is that of language (Setati & Adler, 2001). This is supported by Howie (2003) in her analysis of South Africa in the Third International Mathematics and Science Study, later called Trends in Mathematics and Science Study (TIMSS, 1999; repeat TIMSS, 2003), where South Africa scored the lowest of all participating countries in Africa in both studies, in the learning areas of mathematics and science. The concluding remarks were amongst others that more attention should be given to the use of language in content subject classrooms (Howie, 2003).

This study aims to elicit the experiences and perceptions of FAL English teachers and learners about their challenges and the strategies they use to teach and learn in bi/multilingual ML classrooms, often using a language that is not their home language. This chapter refers to the research methodologies that I will use to attempt to answer the following main research question:
• What are the FAL English teachers’ and learners’ experiences and perceptions concerning the use of English as a LoLT in bi/multilingual ML classrooms?

The research sub-questions that emanate from the research question of this study are:

• What is the language of teaching and learning in bi/multilingual ML classrooms by FAL English teachers and learners and the reasons thereof?

• Do the FAL English teachers and learners feel that they teach and learn ML knowledge and skills better in their home language isiZulu or the LoLT English?

• What interactions (classroom strategies) within a community of practice do teachers and learners experience that indicate successful learning and teaching in bi/multilingual ML classrooms?

3. RESEARCH PARADIGMS

Macmillan and Schumacher (2010) briefly describe research as a “systematic process of collecting and logically analyzing data (i.e. evidence based) for some purpose” (p. 8). According to du Plooy (2009) a paradigm can be defined as “a set of shared basic beliefs about how researchers view that which they study” (p. 19). Guba and Lincoln (1994) define a paradigm as “the basic belief system or world view that guides the investigation” (p. 105).

The view of Terre Blanche, Durrheim and Painter (2006) is that:

Paradigms are all encompassing systems of interrelated practice and thinking that define for researchers the “nature of their enquiry along 3 dimensions: ontology, epistemology, and methodology. Ontology specifies the nature of reality that is to be studied, and what can be known about it. Epistemology specifies the nature of the relationship between the researcher (knower) and what can be known. Methodology specifies how researchers may go about practically studying whatever they believe can be known. (p. 6)
The three dimensions of the interpretive paradigm, as shown in Table 1 below, outline how this study falls across an interpretive paradigm.

Table 1: Interpretive paradigm. (Terre Blanche et al., 2006, p. 7).

<table>
<thead>
<tr>
<th>Interpretive</th>
<th>Ontology</th>
<th>Epistemology</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Internal reality of subjective</td>
<td>• Empathetic</td>
<td>• Interactional</td>
</tr>
<tr>
<td></td>
<td>experience</td>
<td>• Observer subjectivity</td>
<td>• Interpretation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Qualitative</td>
</tr>
</tbody>
</table>

Terre Blanche et al. (2006) describe the interpretive paradigm in that its approach aims “to explain the subjective reasons and meaning that lie behind social action” (p. 7).

According to Creswell (2003) the interpretive researcher tends to “rely upon the participants’ views of the situation being studied and recognises the impact on the research of their own background and experiences” (p. 8). Such a researcher believes that the reality to be studied consists of people’s subjective experiences of the external world (as indicated in Table 1) and thus adopts an interactional epistemology view toward that reality and uses methodology such as interviews to explain the subjective reasons and meanings for that social action. The interpretive research paradigm prefers a qualitative, inductive approach. Macmillan and Schumacher (2010) concur that:

Interpretive researchers use systematic procedures but maintain that there are multiple socially constructed realities. Rather than trying to be objective, researchers’ professional judgements and perspective are considered in the interpretation of the data. There is less emphasis on numbers and more emphasis on values and context. (p. 6)

Although one must always be mindful that the emphasis of any kind of research does not just lie with the numbers or on values and context, but rather on gathering empirical evidence using systematic procedures/inquiry and accepted rules for determining quality and rigor (Macmillan & Schumacher, 2010).

In agreement with the research paradigm of Terre Blanche et al., (2006), du Plooy (2009) further elaborates that every research tradition is characterized by
assumptions that guide researchers in the way in which they approach the phenomenon under investigation, their theoretical viewpoints and the selection of methods and techniques. Figure 7 below shows the four categories of assumptions as interdependent or as a continuum.

Figure 7: Research Paradigms – a conceptual model of assumptions (Smith, 1988, as cited in du Plooy, 2009).

The difference between Terre Blanche’s et al. (2006) dimensions and du Plooy’s (2009) categories is the fourth additional category of theoretical assumptions, as indicated in Figure 7. According to du Plooy (2009), a theoretical assumption is a “generalization that offers a particular explanation of a phenomenon” (p. 21). du Plooy (2009) further elaborates that “the way in which we view communication (reality) influences the ways we regard appropriate to study communication” and thus these assumptions, in turn, influence the selection of a particular theoretical view to explain communication, and collectively determine which research methods and techniques are to be applied (p. 21). Therefore, this study falls across the interpretive paradigm which seems to be the appropriate framework, within which to show the intent, motivation and expectation of this study.
4. PARADIGMS OF THIS STUDY

In this part of the chapter, I will show the inter-connectedness of the ontology, epistemology, methodology, and the theoretical assumptions of the study to reveal the philosophical underpinnings namely an interpretive paradigm according to Terre Blanche et al. (2006), Krauss (2005) and Macmillan and Schumacher (2010).

Mathematical literacy FAL English teachers and learners define their own experiences and perceptions about realities in their bi/multilingual classrooms and the language to be used when engaging with the ML curriculum in order to provide reality. As such, the object of this study is to engage FAL English teachers and learners in dialogue with myself, the researcher, in order to understand their experiences in their own classroom settings. An interpretive paradigm emphasises understanding people in their own terms in their own natural settings where human behaviour and events occur (Creswell, 2009; Howe, 2003). In this study the researcher entered the world of the participants, in their own classrooms, through direct semi-structured interviews within a specific timeframe, during a normal school day as well as through the development of close relationship in the social sense of shared experience and confidentiality. Therefore the researcher had the opportunity to obtain rich understanding of their world as they experience it (Babbie, 2007). The deeper and more genuine the expressions of beliefs and values that emerge, the more meaning and interpretations are negotiated and the more accurate the description of views held are fostered (Howe, 2003).

The premise of this study is based on the theoretical assumption as seen in Figure 7, that in bi/multilingual ML classrooms, individual FAL English teachers and learners experience the external world subjectively, similar to my own bi/multilingual ML classroom. My home language which is English provides the theoretical assumption that lays the foundation for the basis of this study. I believe that ML is a subject that incorporates the use of rich academic English literacy in its curriculum and assessment (especially more present in the ML paper two than in the ML paper one) of the context in order to make sense of the mathematical content. Thereby creating a language gap of FAL English learners and teachers, to the teaching and learning of ML, whose home language is isiZulu. This language gap, identified by
myself, exists in my bi/multilingual classroom and the lived experiences of FAL English learners have revealed challenges with the teaching and learning of ML using LoLT English. Therefore this study explored the experiences, perceptions and interactions (strategies) of other FAL English teachers and other FAL English learners with the teaching and learning mathematical concepts (content) and context of the subject ML and the language in which the ML curriculum is delivered. In this study, my ontological viewpoint is that I believe the reality to be studied consists of people’s subjective experiences and perceptions of the external world. My methodological viewpoint followed an interactional approach where FAL English teachers and learners interacted and shared their experiences and perceptions with myself through a series of semi-structured interviews, also taking an epistemological viewpoint as a participant observer who is empathetic. This made it possible for the participants to be open to the views, feelings, opinions, interpretations, perceptions, experiences and explanations on the meanings they attach to their issues of using LoLT English in their bi/multilingual ML classrooms. These meanings were then interpreted with an attempt to make sense of within participants’ own worldviews and socially constructed realities.

However, a possible barrier in this study is that I am an English home language Indian woman who is trying to “understand the perceptions” and experiences of isiZulu speaking black teachers who have a “different worldview and culture” from my own (Webb, 2010, p. 83). In order to overcome this barrier, firstly, I used an isiZulu speaking research assistant as my translator/interpreter who served as a channel of communication during the semi-structured interview process and later, to verify that my interpretations were in line with the opinions expressed during the interviews. Secondly, I emphasized to all participants to use the language that they were most comfortable with during the interview process. It is these interpretations that provide the foundation to describe this study as a qualitative research that follows an interpretive paradigm (Terre Blanche et al., 2006).

5. DATA COLLECTION: QUALITATIVE DATA

The type of research that defines this study is a qualitative study. The intention of this study was to examine and explore the experiences and perceptions of FAL
English teachers and learners with regard to their language practice in their mathematical literacy classrooms. The method of reasoning is both inductive, when the data is analyzed for codes and categories, and deductive when the literature is drawn on to infer the predetermined themes. In this study, in order to understand the inductive and deductive method of the reasoning, I would start with research questions, such as semi-structured interviews, to collect data and the questions would be based on ontological assumptions drawn from the literature and end with interpretations and descriptions of the responses received, as portrayed in Figure 7.

Since the interview questions are guided by assumptions, there has to be support by relevant literature to avoid research based on subjective reasoning. These assumptions are supported by literature, wherein language is seen as a tool for thinking and communicating mathematical problems (Setati, 2005a). Furthermore, researchers report that in classrooms where English second language speakers are taught in English, code switching practices are likely to happen (Rose & van Dulm, 2006; Setati, 2005). Their research show that code switching fulfils a purpose of clarifying, confirming and the expansion of ideas in classrooms which may aid teachers and learners in attaining their academic goals. As such, this study incorporates some strategies that FAL English teachers and learners use as a coping mechanism to support their challenges and experiences with LoLT English in their bi/multilingual classrooms.

According to Macmillan and Schumacher (2010), qualitative designs are just as systematic as quantitative designs, but they emphasize gathering data (mainly in words rather than numbers) on naturally occurring phenomena. In this study, the phenomena can be described as the meanings of the experiences and perceptions of the FAL English teachers and learners as they engage with the ML curriculum in LoLT English in bi/multilingual classroom. An exploration by the researcher with methods such as individual semi-structured interviews must be used to achieve a deep understanding of the participant’s perspectives. One such interactive qualitative design which focuses on individual lived experience is phenomenology. Macmillan and Schumacher (2010) states that:
A phenomenological study describes the meanings of a lived experience. The researcher collects data on how individuals make sense out of a particular experience or situation. The aim of phenomenology is transform lived experience into a description of its “essence,” allowing for reflection and analysis. The typical technique is for the researcher to conduct long interviews with the informants directed toward understanding their perspectives on their everyday lived experience with the phenomena. (p. 24)

This study provided a forum for the participants to share their challenges and frustrations about their lived experiences in post-apartheid bi/multilingual ML classrooms. The researcher who draws on the phenomenon that arises from the lived experiences and perceptions of the participants, in the process reflects on essential themes that the literature has discovered, so it is not just descriptive but an interpretive process where the researcher makes an interpretation of the meaning of the lived experiences into themes that will develop from the semi-structured interviews. This study recognises the value of working directly with the experiences and understanding of others, hence it makes use of semi-structured interviews as a data collecting instrument. Understanding is acquired by analysing the many contexts (experiences and perceptions) of the participants and by narrating the situations and the events. Feelings, beliefs, views, opinions, explanations, ideas and thoughts should be captured in order to gain an understanding of the participants’ experiences. In other words, the qualitative data in this study is open to interpretation of the researcher. This study between the researcher and the participants allows the researcher to explore how the participants think and feel.

Creswell, Hanson and Plano Clark (2007) argue that in the phenomenology theory the researcher collects the views of a number of participants and instead of generating a theoretical model they describe all that the participants have in common. Van Manen (1990) says that the very basic purpose of phenomenology is to reduce the experiences of the persons with the phenomenon to the description of the universal essence, “a grasp of the very nature of the thing” (p. 163). Mathematical literacy FAL English teachers and learners define their own experiences (situations) and perceptions about realities in bi/multilingual ML classrooms and suggest what language they feel should be used when engaging
with academic literacy that is so embedded in the context and the content of the ML problems.

5. 1. Sample and Setting

According to Patton (2002) qualitative sampling is “selecting information-rich cases for study in-depth” about those cases without generalizing to all cases namely a larger population (p. 242). Macmillan and Schumacher (2010) agree with Patton (2002) when they state that the power and logic of qualitative sampling is that a few cases (sample) studied in-depth provide many insights about the topic and its purpose is not for generalization to a larger population.

The main aim of the sampling in this study was to select possible research participants (grade 12 FAL English ML teachers and learners) because they possessed characteristics, opinions, knowledge, ideas, and perceptions or experiences that may be particularly relevant to this research. A sample of three FAL English ML teachers and five FAL English ML learners from each of five different rural secondary schools were selected. All participants were from schools situated in the rural areas of the Midlands area in KwaZulu-Natal. The five schools were a purposive sample. Macmillan and Schumacher (2010) states that:

In purposive sampling the researcher selects particular elements from the population that will be representative about the topic of interest and on the basis of the researchers knowledge of the population, a judgement is made about which subjects should be selected to provide the best information to address the purpose of the research. (p. 138)

The selection of the schools was done according to the school’s performance in the grade 12 National Senior Certificate (NSC) examinations (2009-2010). Two secondary schools that performed well, one that had performed averagely and two that had poor performance were selected for this study. Another consideration was the influence of school context with respect to schools being zoned according to quintile rankings by the KZN DBE. Amongst the criteria used in order to rank schools from quintile 1 (deep rural) to quintile 5 (urban), were the schools' locations, population, infrastructure and development of surrounding roads. One secondary
school was ranked quintile 1, while two secondary schools were ranked quintile 2 (rural) and two secondary schools were ranked quintile 3 (township). A process of constant comparison between participants being studied is necessary since this study is in search for understanding all aspects of the research. Purposive sampling was employed in this study because:

- Each case must be studied against the background of more universal social experiences and processes (Struwig & Stead, 2007).
- It involves low cost.
- The time taken to collect the data was fairly less.
- It was easily accessible.
- The safety issue was not compromised.

I decided that it would be most informative to interview master or senior teachers from both genders, of grade 12 ML classes, who have had several years of experience in the teaching fraternity rather than a sample of all ML teachers. Information about the school and the teachers were obtained from a school profile and teacher profile form (see appendices B and C) that was completed by all ML teachers from the chosen schools.

Teacher participants were selected based on the appropriate information from the teacher profile form, such as; being a grade 12 FAL English ML teacher. The selected teacher participants were given consent forms and all teacher participation was voluntary. All ML teachers from the participating schools were in possession of an appropriate teaching qualification ranging from diplomas, additional ACE qualifications, and B. Ed. degrees to B. Ed. Honours degrees, as indicated in Table 2. Table 2 also outlines the number of learners at the participating schools, the number of teachers involved in the FET phase in the subject ML, and their number of years of experience in the afore-mentioned subject.
Table 2: Overview of the FET phase teachers from the participating schools.

<table>
<thead>
<tr>
<th>SCHOOLS</th>
<th>NUMBER OF LEARNERS IN THE SCHOOL</th>
<th>NUMBER OF TEACHERS IN THE FET PHASE OF MATHEMATICAL LITERACY</th>
<th>GENDER</th>
<th>TEACHER QUALIFICATIONS</th>
<th>NUMBER OF YEARS OF TEACHING EXPERIENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MALE</td>
<td>FEMALE</td>
<td>TEACHING CERTIFICATE</td>
<td>MATRIC+2 YEARS</td>
</tr>
<tr>
<td>SCHOOL ONE</td>
<td>772</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>SCHOOL TWO</td>
<td>1087</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>SCHOOL THREE</td>
<td>678</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>SCHOOL FOUR</td>
<td>724</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>SCHOOL FIVE</td>
<td>743</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Also, from each secondary school, a sample of five grade 12 ML FAL English learners of both genders was chosen, since they have more experiences with the subject ML having progressed through the FET phase. These learners were selected randomly from the class marksheet registers of the teacher participants from the school. However, all learner participation was voluntary. Although Table 2 indicates the total number of learners in the participating schools and all the ML teachers from the FET phase, not all these teachers or learners have participated in this study. Table 3 indicates the quintile status of the participating schools, as well as the number of teacher participants from each school with their qualifications and their number of years of experience in the afore-mentioned subject.
Table 3: Overview of the participating schools with their corresponding quintile status and the participating teachers in this study.

<table>
<thead>
<tr>
<th>SCHOOLS</th>
<th>QUINTILE STATUS</th>
<th>NUMBER OF PARTICIPATING MATHEMATICAL LITERACY TEACHERS</th>
<th>GENDER</th>
<th>TEACHER QUALIFICATIONS</th>
<th>NUMBER OF YEARS OF TEACHING EXPERIENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>MALE</td>
<td>FEMALE</td>
<td>FROM 1 YEAR TO 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>FROM 6 YEARS TO 15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>FROM 16 YEARS TO 25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>FROM 26 YEARS AND MORE</td>
</tr>
<tr>
<td>SCHOOL ONE</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>SCHOOL TWO</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>SCHOOL THREE</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>SCHOOL FOUR</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>SCHOOL FIVE</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

The most surprising element of this study to me was the low number of learners who have chosen the subject ML in the selected schools as compared to the majority of learners who have chosen mathematics as indicated in Table 4. Since my own school is an urban school (quintile 5), the expectation from me was to see the same scenario of more ML learners than mathematics learners existing in other schools or maybe almost all learners choosing ML instead of mathematics. This impacted negatively (the data was to reveal the experiences and perceptions of grade 12 ML teachers who would be more well-informed because of the graduation/progression of the ML curriculum from grade 10 to grade 12) on my research, because, at two schools (school 2 and school 3) in particular, I was only able to obtain two grade 12 ML FAL English teachers to conduct interviews with and capture the data.
However, with further inquiry about the willingness of the other grade 11 and grade 10 ML FAL English teachers from these schools, I was able to access the desired number of ML FAL English teachers by including a grade 10 and 11 ML teacher each, from these two participating schools. The fact that the majority of learners chose mathematics and not ML in the chosen schools in this study meant that there was a decreased number of grade 12 ML teachers and those teachers were involved in two learning areas, for example, life sciences and ML and physical science and ML.

Table 4: Overview of average number of learners per grade in the FET phase choosing mathematics and ML in the participating schools with comparison to the researcher’s school.

<table>
<thead>
<tr>
<th>SCHOOLS</th>
<th>AVERAGE NUMBER OF LEARNERS PER GRADE IN PARTICIPATING SCHOOLS</th>
<th>GRADE 10</th>
<th>GRADE 11</th>
<th>GRADE 12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MATHS</td>
<td>MATH. LIT</td>
<td>MATHS</td>
<td>MATH. LIT</td>
</tr>
<tr>
<td>SCHOOL ONE</td>
<td>146</td>
<td>40</td>
<td>109</td>
<td>38</td>
</tr>
<tr>
<td>SCHOOL TWO</td>
<td>160</td>
<td>52</td>
<td>121</td>
<td>56</td>
</tr>
<tr>
<td>SCHOOL THREE</td>
<td>106</td>
<td>43</td>
<td>96</td>
<td>41</td>
</tr>
<tr>
<td>SCHOOL FOUR</td>
<td>98</td>
<td>62</td>
<td>103</td>
<td>42</td>
</tr>
<tr>
<td>SCHOOL FIVE</td>
<td>78</td>
<td>64</td>
<td>84</td>
<td>68</td>
</tr>
<tr>
<td>RESEARCHER’S SCHOOL</td>
<td>58</td>
<td>198</td>
<td>35</td>
<td>150</td>
</tr>
</tbody>
</table>

For all learners in the participating schools English was the language of learning and teaching (LoLT) that was different to their home language which was predominantly isiZulu. All teachers in the participating schools were also FAL English with isiZulu being their home language. It has been revealed by Setati (2005a) in her study on language use in multilingual mathematics classrooms that many cases both teachers and learners are not fluent in English themselves although they are required to teach and learn in English. It is from this notion that the chosen schools fitted the description of the aims and objectives of this study.
5. 2. Semi-structured interviews

The data collecting instrument that was used to answer the question in this study was a semi-structured interview. The goal with each teacher and learner participant was a single, long (+/-1 hour) comprehensive interview to elicit in-depth data on their meanings that could provide an understanding about how the participants view their world and how they explain or make sense of their lives. Such an interview process is described as a “phenomenological interview” (Macmillan & Schumacher, 2010, p. 356). This is in keeping with the qualitative design of phenomenology as mentioned earlier. Such interviews, with the participants, could investigate what was experienced and how it was experienced by the FAL English teachers and learners' realities in bi/multilingual ML classrooms.

According to Struwig and Stead (2007) a semi-structured interview is a combination of the structured and unstructured interviews. In this study, qualitative measures were generated through predetermined questions (see appendices J and K ) that were posed in a systematic manner, but the nature of the questions was open-ended. This allowed the FAL English teachers and learners to share what they thought about academic literacy embedded in ML problems and assessment tasks. It also gives an opportunity for the participants to discuss issues that go beyond the questions' limitations, for example, they could discuss which language they thought would make a difference in implementing the strategies most suitable in the ML classroom and which language they thought would communicate mathematical literacy better. It also allowed me, the interviewer, to probe and to ask follow-up questions based on the participant’s response especially if the responses were unclear or incomplete. According to du Plooy (2009) such a process of data collecting allows the interviewer an opportunity to explore the reasons behind the reply.

A very important aspect of the interview process was the use of an interpreter/translator. I used a colleague from my own school who is proficient in isiZulu to serve as my interpreter/translator during all interviews. In my study, I did not want language to be an obstacle to the communication between myself, the researcher, and the participants. In this study, the interviews were conducted in English, the
language of learning and teaching, and my interpreter/translator communicated all the questions in isiZulu to the participants. Every participant was requested to use the language that he/she was comfortable with. During the interview, their responses were communicated via my interpreter/translator to me in English. All of the dialogue between the participant, interviewer and interpreter/translator was audio taped. Most of the participants spoke in their home language isiZulu while some participants opted to speak in English only, or code switched using their home language isiZulu. At certain times, the interpreter/translator was interrupted by the participants as they would correct/clarify/add some information to the interpreter/translator’s version of their answers. This was a mammoth task that took a lot of patience and time from all participants, the interviewer and the translator/interpreter during the interview process. Each interview took approximately 50 minutes.

The teacher interviews were designed to probe the following:

- Why do the teachers use their chosen language practice to support classroom communication and how is this done?

- Which language (isiZulu or English) do they think would make a difference in implementing the academic literacy used in the interplay of the content and context in the ML word problems and why do they feel this way?

- Which language do they believe communicates ML better to the learners?

- What, do they think, has made a difference to understanding ML in their lessons (if any)?

- Why did they choose to use a certain language rather than another at different stages in their teaching in their classrooms?

All the participants were asked the same questions in the same order, but the questions were open-ended for reasons already mentioned above.
The learners were also interviewed individually to find the following:

- What language do they use the most to communicate with the teacher/other learners in their classroom while engaging with their classwork?
- What difference do they feel that English, being the language of learning and teaching, makes to their understanding of ML?
- What language do they think/feel would be more comfortable to communicate with in class work as well as assessments and why do they feel this way?

All records of interviews with participants including the translations from English to isiZulu and vice versa, from the audio recordings were transcribed and stored electronically on a computer disc. I kept notes during the interviews especially to take into account events such as hand gestures and body language that cannot be captured on an audio tape.

6. TRUSTWORTHINESS AND CREDIBILITY OF INSTRUMENTS

According to Struwig and Stead (2007), “validity, also referred to as trustworthiness or credibility, is also considered in qualitative research” (p. 143). Macmillan and Schumacher (2010) describe qualitative validity as “the degree of congruence between the explanations of the phenomena and the realities of the world” (p. 330). A question that arises in qualitative validity is: Does the researcher actually hear the meanings that they think they hear, particularly if the answers are translated by a third party? Therefore, the essence of validity would be the “mutual meanings” between the researcher and the participants who should agree on the description and composition of events and especially the meanings of these events (Macmillan & Schumacher, 2010, p. 330). In this study validity as described by Macmillan and Schumacher (2010) was enhanced in 3 ways:

- The semi-structured interviews were conducted in the participants’ natural settings (the school institution) to reflect lived experience.
- Through precise recording of all interviews using audio-recordings which were thereafter transcribed into verbatim transcripts.
• All participants were asked to review the verbatim transcripts of interviews with participants for accuracy of representation.

A colleague who has a Masters degree in school guidance and counselling independently checked the transcripts of the data with the codes and categories to ensure valid analysis of the data and confidence in the findings in this study. According to du Plooy (2009) having an outside person act as a judge to ensure that misrepresentation and bias did not occur, is referred to as “intercoder reliability” (p. 133). As mentioned earlier, every participant was asked the same questions in the same order. This ensured, to a certain degree, that the questions in the interview were stable and would be consistent over a period of time.

7. REFLEXIVITY OF THE QUALITATIVE RESEARCH

The progress of this study has emanated through the examination of my personal and theoretical assumptions of the phenomena that exist within my own classroom as described earlier in this chapter, thereby creating a motivation for: the selection of the interpretive qualitative approach; framing the research problem; generating data with semi-structured interviews; relating to participants in their home language by using a translator/interpreter and developing specific interpretations of the data. Also, all data collected were constantly processed several times and reconstructed in my mind, firstly; by playing and replaying the audio recorded data as the verbatim transcripts were written, and secondly; by reading and rereading the verbatim transcripts as the data was coded and categorised. This was done by repeated analysis of the data, using the coding steps outlined by Tesch (1990), by checking on the set codes and categories. Macmillan and Schumacher (2010) describe this as reflexivity. The data obtained from the participants may reflect particular views of the researcher and may even be influenced by the researcher’s presence and mood. In order to minimise predispositions through self-questioning, the researcher could focus on reflexive questioning as suggested by Figure 8.
In this study the reflexive screens within the triangle of Figure 8 outlined some key aspects that provided an essential guide for me to use data gathering instruments such as profile forms outlining details of the participants and their schools. Also I was able to make several visits to the school, prior to the interviews, firstly, to gather information about the participants and the schools, secondly, to obtain permission of the participants and the schools, thirdly, to conduct the interviews over several days with all the participants and lastly to review my synthesis of the interviews. During these meetings I was able to minimise potential researcher bias by spending more time in the setting of the participants with the participants. Also in this study, some of the above reflexive questions, as seen in Figure 8 (such as: How do they perceive me? How do I know? How do I perceive them?), were taken into consideration that allowed myself enough time to build trust, keep good relations, show respect and the non-judgemental nature of myself as the researcher to all participants. This was done by casual meetings with the participants in their breaks or free periods during my visits to the schools, prior to the interviews. I also utilised the opportunity prior to the interviews to highlight the ethical considerations of this study to all participants.
In this way the interactive process of the semi-structured interviews could delve deeply into the feelings, beliefs, views, opinions, explanations, perceptions, experiences and thoughts to capture the essence of the participants.

8. ETHICAL CONSIDERATIONS

I obtained ethical clearance from KwaZulu-Natal DBE and NMMU Faculty of Research Ethics Committee, the concerned schools’ principals, teachers, and learners to proceed with my research. The parents of the chosen learners were also consulted for permission as the learners were minors. During the second visit to the participating schools by me, the FAL English learners that were identified as participants, as mentioned earlier in the chapter, were issued with permission letters to take home to be completed by their parents. The purpose of the research was explained verbally and in writing to all participants in the research and they were assured that all participation was voluntary. Participants were also informed prior to the research that they were free to decline or withdraw at any point in the research process. The confidentiality and anonymity of all participants were ensured in the form of a written consent. The information given on the consent form assured the participating schools’ principals, teachers and learners that pseudonyms were to be used throughout the written report in this study in order to ensure the schools’ and participants’ privacy and anonymity. During the interviews, my interpreter and I attempted to be as neutral as possible in our relationship with the participants by not using leading questions or interjecting with our own views or opinions. This was done to alleviate any sampling bias and language bias. I obtained written permission from all the participant interviews to be audio recorded during all interviews.

During a fourth visit to the school, accurate interview transcripts of the raw data (typed verbatim transcripts from audio recordings) were made available to all participants after the research process was completed for their comment on its accuracy. In this study all participants were requested to append their signatures on the last page of the interview transcripts to acknowledge its accuracy. They were also requested to provide comments on the interpretations of the researcher on the interview transcripts, of which the researcher was able to review the interpretations to bring about clarity. Interpretive validity was obtained by asking participants to
comment on the interpretations of the researcher (Struwig & Stead, 2007, p. 61). At all times, the participants were constantly reminded that this study incorporated their worldviews and experiences, and their opinions and beliefs would not be condemned or judged but rather, provide rationale into the situations in which they function.

9. CHAPTER SUMMARY

In this chapter I have outlined the research paradigms of this study, the qualitative research approach methods, the research design, the instruments and strategies of data gathering and the detailed research process as used in this study. The treatment of the data, issues pertaining to trustworthiness and credibility, researcher reflexivity of this study, as well as ethical issues that guided this process were also described, discussed and explained. The next chapter focuses on the findings of the qualitative methods of the study, where the data analysis process will be demonstrated and discussed.
CHAPTER 4

ANALYSIS AND DISCUSSION OF RESULTS

1. INTRODUCTION

The purpose of this study was to better understand and interpret the FAL English grade 12 ML learners’ and teachers’ experiences and perceptions with the teaching and learning of ML in LoLT English, which is not their home language in order to be able to use and promote good classroom practices to facilitate optimal learning and teaching. The participants were asked to describe their teaching and learning experiences and perceptions of using English as the LoLT in their bi/multilingual ML classrooms. The objectives of the study were as follows:

- To engage FAL English teachers and learners in dialogue with the researcher through interviews in order for the researcher to understand their perceptions of their own classroom settings.
- To understand and interpret the experiences and perceptions of FAL English teachers and learners in their bi/multilingual ML classrooms.
- To identify the preferred language use of FAL English teachers and learners and the reasons thereof when teaching and learning takes place in their bi/multilingual ML classroom.
- To probe and bring forth the challenges and problems that FAL English teachers and learners encounter on a daily basis with the LoLT English.
- To elicit and draw on the FAL teachers’ interactions and strategies in their bi/multilingual ML classrooms as a community of practice in order to promote good classroom practice to facilitate optimal teaching and learning.

In order to address the research objectives, qualitative data were collected using semi-structured interviews with five grade 12 ML FAL English learners and three ML FAL English teachers from each of the five secondary schools in this study (learners [n=25] and teachers [n=15]). All participants were asked the same questions (attached as appendices D and E) during the interviews. Since the essence of this
study was based on language issues, it was appropriate to have conducted the interviews in English by myself, the researcher. My interpreter/translator communicated my questions to both the teacher and learner participants in isiZulu. The participants were requested to use a language that they were most comfortable with to respond, and my interpreter translated their responses to me in English when it was required. The idea of using a translator/interpreter was to provide the participants with the comfort of expressing themselves wholly in their home language. Although the majority of the participants responded throughout the interviews in their home language isiZulu all transcripts were presented in English via the translator/interpreter, with some original isiZulu quotations being illustrated.

This chapter deals with the analysis and interpretation of the qualitative data generated in this study using the methodology described in chapter three. The qualitative data generated from the semi-structured interviews are also presented. According to Creswell (2009) the analysis of qualitative data is complex and requires cautious and accurate analysis and interpretation capabilities. Therefore, it is of “the utmost importance that the objectivity of and the attention to detail in the interpretation remain reliable” (p. 7). In order to do this I assessed the accuracy of the findings by checking all transcripts for possible mistakes made during the initial transcription. Macmillan and Schumacher (2010) agree that making sense of the data depends largely on the researcher’s intellectual rigor and tolerance for tentativeness of interpretation until the analysis is completed (p. 368).

Data analysis, organisation and interpretation were done using a process of both deductive and inductive analysis. Predetermined themes were generated from the literature review in chapter two which assisted in the development of the research questions and research instrument that revealed the embedded themes in the data. These predetermined themes were: the power of English which was a sub-heading in chapter 1; language and communication appearing in the literature in chapter 2 framing this study; classroom strategies and solutions and the experiences and involvement in the learning activities which were highlighted explicitly in the literature review in chapter 2. The teachers’ data also revealed an emergent theme, the need for support. The coded information from the interviews was synthesised and grouped into main categories that emerged following the process of inductive
data analysis. Each category concurred with and spoke to the themes that were identified from the literature review. Each category for the teachers’ and learners’ views is discussed separately with quotations from the participants and also referenced within the context of the literature review.

2. ORGANISATION OF THE PROCESS OF DATA ANALYSIS

Macmillan and Schumacher (2010) state that qualitative analysis is a relatively systematic process of coding, categorizing, and interpreting data to provide explanations of a single phenomenon of interest (p. 367). The overview of the general process of data analysis that is used in this study is represented by Figure 9. Various steps that show the overlapping phases in Figure 9 are described and illustrated. The idea behind the overlapping phases is to ensure that I constantly “double check and refine my analysis and interpretation” to check whether the codes that appear from the data concur with the codes identified in the literature (Macmillan & Schumacher, 2010, p. 367). This clearly illustrates that this method of data analysis scrutinises and re-examines the data for any repeated data and new data that presents itself in order to identify the contradictions and tensions in the individual experiences of the teachers and learners.

Figure 9: General process of data analysis (Macmillan and Schumacher, 2010, p. 368).
Step 1: Collection of data and process of the semi-structured interviews, recording of the interviews by audiotape and written researcher’s notes. Use of an interpreter/translator during all interviews with the participants.

Step 2: Listening to the audiotape in order to transcribe the interviews verbatim into written transcripts in English, as per the interview questions with the participants. For the participants’ written transcripts I created a tracking system in order to maintain the anonymous reference in this study. Each school [S] was assigned labels from 1 to 5; teachers [T] from each school were assigned labels from 1 to 3 and learners [L] from each school were assigned labels from 1 to 5, such that, School 1 Teacher 1 was tracked using [S1T1]. The supplementary data (verbatim transcripts) are presented without any attempt to correct the grammatical errors.

Step 3: The verbatim transcripts were read repeatedly to obtain a general understanding of the interviews and also to familiarise myself with the data. From the transcribed data, text segments with similar ideas were found and assigned a code (Tesch, 1990). This coding was done manually. After coding, similar ideas were grouped together in order to categorise them. Constant comparative content analysis of the coded data generated the emergent categories. According to Macmillan and Schumacher (2010) patterns are identified by iterative reflection (p. 366). At this point, from the coded data I looked for ideas that occurred frequently or meanings that fitted into the categories. The transcribed data were also read and re-read to scrutinise for any further new codes and categories that may have not been covered by the emerged categories. The number of categories was reduced by grouping similar categories.

Step 4: The coded information was used to link the categories and interpret themes. In order to interpret themes, the coded data had to be reduced by collapsing overlapping information into categories and eliminating any redundant information. The categories were related to the predetermined themes that were embedded in the research questions, stemming from the and generated from the literature. These are presented in Table 5.
Step 5: The nature of this qualitative research allowed me to identify dialogue that describes individual experiences and perceptions that support themes that were predetermined. According to Creswell (2009) such reporting and representations of findings are referred to as ‘constructing narratives’.

3. THEMES AND CATEGORIES

The themes from the literature and the emergent categories from the data for the teachers’ and learners’ views are presented separately in Table 5. Each category from each theme will be discussed individually with accompanying quotations from the teachers’ and learners’ responses and also referenced within the context of the literature review.

Table 5: Themes and Categories

<table>
<thead>
<tr>
<th>Themes</th>
<th>Teachers’ Categories</th>
<th>Learners’ Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. 1. Theme 1 The Power of English</td>
<td>• Teachers’ choice</td>
<td>• Learners’ choice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Bi/multilingualism</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Family Pressure</td>
</tr>
<tr>
<td>3. 2. Theme 2 Language and Communication</td>
<td>• Language literacy skills such as: fluency; comprehension; writing; copying; reading and hearing</td>
<td>• Language literacy skills such as: fluency; comprehension; reading; copying; and writing.</td>
</tr>
<tr>
<td></td>
<td>• Emotions such as loneliness, helplessness and lack of confidence.</td>
<td>• Poor mathematical skills</td>
</tr>
<tr>
<td></td>
<td>• Setting and context</td>
<td>• Setting and context</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Stigmatisation</td>
</tr>
</tbody>
</table>
### Themes

<table>
<thead>
<tr>
<th>Themes</th>
<th>Teachers’ Categories</th>
<th>Learners’ Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. 3. Theme 3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Classroom Strategies and Solutions | • Effort  
• Forming an ML classroom into a community  
• Language practices such as: code switching, translation and revoicing  
• Group work  
• Discussion  
• Involvement in the teaching and learning activities | |
| 3. 4. Theme 4 | • Lack of in-service training  
• Professional development/qualification in ML | |
| 3. 5. Theme 5 | • Classroom climate  
• Group work  
• Discussion  
• Code switching | |

| 3. 1. Theme 1: The Power of English |

The research questions in the interview protocol that were used to elicit findings about the power of English were:

For the teachers:

- How do you feel using English as a medium of instruction and for assessment in your mathematical literacy classroom? From the response -
probe further to ascertain specific reasons and further question the acceptance and advantages of English as a LoLT.

And for the learners;

- How do you feel being taught in English? Please elaborate.
- Would you prefer being taught in your home language, i.e. isiZulu?
- How would this impact/effect you in the all the class assessments and examinations that are written in English?
- Do you feel that you would be losing your culture if your teacher only uses English?

The categories below present the first theme, namely, the power of English.

### 3.1.1. Teachers' choice of language

Teachers expressed that LoLT English was an important language because the curriculum has to be delivered using it as decreed by the LiEP (DoE, 1997). The teacher participants shared their views with the interviewer as follows:

*The department has this policy and we have to use it, so our children must use English to learn.* [S2T2]

They also highlighted that to enable access to “social goods” and for future success globally, competency in English is required (Setati, 2002).

*Learning in English may not make our learners perform too well now, but at least they are learning it with their home language, they will be able to use it one day in their job when they are away from the house.* [S4T2]

*Izijnjane zethu kumele zithole isinjisi kanye nesi Zulu ngendlela yokunci ntiselana (qhudilana) ndawonye. (Our children must gain English and isiZulu competency together). How are they going to succeed if they learn one only, like one language is more important than the other? I always tell them that you have to be good in both to go anywhere in our community, country or even in the whole world.* [S1T3]
Everything in the world is surrounded by English, if our children from this community go to town and want to buy a pen or pencil from a shop how are they going to get it? I say that learning in English is good. [S2T2]

Teacher participants drew attention to their positive attitude about acquiring fluency in the language English that has helped them in their teaching.

It was difficult for me too to teach myself English, when I was in school I only did mother tongue instruction and even in college, Now I have to change and learn this new language and in the years to come I have developed so well so far and I am equipped to teach my children in English. [S2T1]

We have to believe that we can manage to become very good in this language. [S3T2]

The teacher participants expressed a strong preference for learning in English and developing competence in that language, thus reflecting the strong powerful position of English. The perception is that many teachers equate education with English. These findings were consistent with those of Setati (2005a) and Gee (1994) who attribute this perception to the desire for access to social goods. In essence, Setati (2008) resonates that South Africans see English as having access to “social and economic power” (p. 103).

3.1.2. Learners’ choice of language

The learner participants shared similar sentiments to the teachers with the researcher. Many learners provided substantial reasons for wanting to be literate in English other than achieving mathematical success in school. Some of the learner participants described the importance of acquiring English competency when they reverberated utterances similar to the literature which described that it allows “access to social goods”, secure jobs that you can progress in and being able to fit into a broader outside society (Gee, 1994; Setati, 2005a). As some of the learners remarked below:

The world is so great like I mean big, I will have an opportunity to socialize with other people in English that will be good. [S1L3]
English is there in the jobs that we are going to do and other people that we are to meet one day, so I want to learn in English too, it is hard but I have to. [S5L1]

If I want a job, I will have to know English. [S5L1]

If I can speak and learn very good English then one day I will control my path in life, getting a good job and a nice house, I will be in control of that. [S4L5]

Learners also highlighted the importance to learn in LoLT English because their examinations, assessments and textbooks are in English. This finding is confirmed by the following comments:

In the exam I am going to be on my own so I need to understand English now to be good in my calculations. [S2L2]

In the textbook it is all like in English that I have to follow and complete my work…I cannot translate the textbook to make it easy, its like stupid I mean its hard and wasting time, I have to learn it in English. [S5L2]

English is good, although I struggle, I can always ask my teacher in isiZulu and he will tell me in English…the exam is in English. [S3L1]

Some of the learner participants went on to elaborate the importance of learning in English with other reasons that go beyond the classroom. They added the following:

Even our President Jacob Zuma addresses our country in English, then why should I reject English? [S2L2]

It is not that English is in our school only, if we look around us, then we will see that this language (English) is here and we should know it, we should just be good at it. [S1L1]

The findings of the learners’ views concur with the teachers’ views. The learner participants described the importance of learning in English citing that it allows “access to social goods” and secure jobs that you can progress in and being able to fit into a broader society (Adler, 1998; Setati, 2005a). Learners have also interpreted
that the LoLT English is the language to learn in since all assessments, examinations and textbooks are in English. The findings of this study at this point illustrate the knowledge gap that exists in many bi/multilingual schools in relation to the interpretation of LiEP (DoE, 1997). Heugh (2002) in accordance with the LiEP (DoE, 1997) describes that bilingual education for each child within a multilingual educational policy does not mean a choice between either English or an African language, it means both.

3.1.3. Bi/multilingualism – Learners’ views

Some learners intimated that they would choose learning in their home language with English but, they were caught in an impasse when they weighed the positive opportunities of fitting into a larger community of English speakers, by learning in English. Their comments were:

When I learn in isiZulu, I feel that I am not doing the right thing...yes I am able to learn better in isiZulu but I feel that for me to be a part of the bigger community one day it will be difficult for me...so I have to do English too. [S1L2]

isiZulu is my language, eh, and my soul but I have to compromise with English to make it out there. [S1L4]

Learners are under the impression that in order to learn effectively they must choose English over isiZulu. The Thomas and Collier study (2002) on education in the USA included full mother tongue instruction programmes. In their study, the most unsuccessful results were with students in regular programmes where the students’ mother tongues were either not supported at all or where they only had some mother tongue instruction. The students’ learning in USA was mainly done in English, a language that is not the mother tongue of the students. Studies by Foley (2007) describes that literacy skills such as reading and writing are best acquired through the medium of the mother tongue and these skills transfer relatively easily to FAL English, so that, in fact, proficiency in the LoLT English is in no way prejudiced by the continued development or greater allocation of time to the home language.
3.1.4. Family Pressure – Learners’ views

This category was identified from the responses of the learners only. The learner participants highlighted the influences of their parents in their education. Some of the parents or family members, as indicated by the learner participants, did mention the importance of learning in English and its power. Comments in this regard included:

My father she is working in the prison, she is saying that English is important to climb the ladder, she complains all the time that she is working for 20 years there and will not go higher because it is not good at English. Many younger isiZulu workers have been promoted because of their good English, it’s like important to know English…but she (his father) does not even try to speak English at home. [S5L4]

Ugogo wami usebenzisa isiNgisi esingesihle, kodwa usitshela ukuthi asimufundise kodwa usemdala, yini afune ukufunda isiNgisi manje siyakudizya, uhlezi esho njalu. (My grandmother she uses some English that is broken, but she tell us to teach her but she is too old, why she want to learn English now, we need it, she says that all the time.) [S3L1]

My parents are old and are at home, they want me to do good, to work and learn English well so I can survive in the other world. [S4L1]

However, learners felt that their parents or family did not show much encouragement and support towards their actual learning. They added the following:

My mother and father are always talking about our English and how important it is to us to learn it, it took so many years for Tata Madiba to fight for our equal rights, including learning in English so that we are not left behind in our education,…but can they talk the English good, my father cannot help me with my homework. [S4L3]

Abazali bathi bobuza uthisha wakao, angazi yingakho ngakuthumelela esikolizu, lento ave iyinselelo.(They (parents) say to ask your teacher, I don’t know, that is why I send you to school, this is too challenging)…I am not good at English or maths or geography. [S5L3]
My parents do not even ask about my schoolwork, I have to meet this challenge on my own, but they say that I must learn English and not be like them. [S2L3]

The learners' perceptions revealed that it is the pressure of their parents that steers them towards wanting to learn in English. In de Klerk’s study (2002) she highlights that many parents love their mother tongue, but the pressures of a modern society and global influences steer their minds to the advantages of being fluent in English. Her study revealed that parents force their children to learn in English but they themselves do not know the language. Her study further explains that, “for political, economic and educational reasons, parents want their children to be assimilated into a single unified national culture which will probably be western to the core” (p. 31).

3. 2. Theme 2: Language and Communication

The categories that are presented below correspond with the identified theme from the literature, language and communication. The research questions in the interview protocol that were used to elicit findings on the theme language and communication were:

For the teachers:

- Which language(s) do you use to support your teaching of the inter-related nature of mathematical literacy content and context in your classroom? Why do you choose to use this language(s)?
- Which language(s) do you prefer to use when clarifying specific concepts, (that is to bring about conceptual understanding) that are so content driven by the mathematical literacy curriculum? Why do you choose to use this language(s) at this point in your lesson?
- Which language(s) do learners use as a channel of communication with you or their classmates in order to understand the contextual word problem-solving? Why do you think they resort to using this language(s)?
- Do you provide learners with opportunities (lesson strategies) to talk (exchange ideas), discuss, argue and engage in conversation when you teach? How do you do this during your lesson?
Which language do you mostly use to teach and revise the word problem-solving and word problem-posing that is richly filled with academic literacy, for example, in assessments like examinations? Why do you choose this language(s)?

And for the learners:

Which language do you use to communicate with your:
- Classmates in your mathematical literacy classroom? Why do you use this language(s)?
- Teacher in your mathematical literacy classroom? Why do you use this language(s)?
- Friends during your breaks or in the playground? Why do you use this language(s)?
- Family and relatives at home? Why do you use this language(s)?

Which language do you prefer to use when you solve word-problems in your mathematical literacy tasks, activities or assessments? Why do you use this language(s)?

3.2.1. Language literacy skills – Teachers’ views

This category of language literacy skills includes skills such as: fluency; comprehension; writing; reading and copying which were identified as sub-categories from the data. Many of the teacher participants were in agreement with each other when they highlighted that their own skills with fluency and the comprehension of ML word problems or scenarios/story sums (as they are commonly termed by researchers such as Brombacher (2007) in ML) were their greatest challenge. These were their comments:

Ay…The English pronunciation is difficult, you have to be clear in the way in which you speak or else you are misunderstood or the English language will come out like a combination of, you know like a mixture of both. [S1T1]

ML demands a high level of fluency of English which I feel challenged with it. [S4T1]
I prepare in advance with my problems that I want to use because I want to make sure that I comprehend the problems thoroughly. [S3T2]

Some teacher participants were involved in the learning areas of both mathematics and ML at their school. They compared and contrasted the two subjects with regards to the content and context and its use of the English language. These teachers stressed that mathematics problem-solving does not demand too much of English comprehension from themselves or the learners due to the nature of the curriculum being more content based. However, they highlighted that ML demands more contextualized application and real-life problem-solving that is generally laid out as a story (context) or more appropriately a comprehension style question. This finding is confirmed by the following comments:

In my maths classes we do not have a problem with the language so much as my ML classes…they are citing that ML problem-solving is like trying to understand an English language comprehension passage. [S4T3]

Abafundi bathi imibuzo yeML mide kangangoku thi uthi uqeda ukuyifunda usuke usukhohliwe ukuthi kufanele usale ini okokuqala nje ngiyavumelana nasi. (Learners say that the ML questions are long that by the time you finished reading the question, you have forgotten what you were supposed to calculate in the first place, I agree with them). [S5T3]

The learners like ML because of the real-life situations but they wish that it was just numbers in all questions. [S4T3]

Maths is like figures and numbers and theorems and proofs. Simple, solve for x? It’s not like ML, always the question is crowded by words in a story or a case study that you have to understand first and interpret. [S5T3]

Some of the teacher participants also highlighted their concern with the learners’ ability to write out answers. They have provided descriptions that show that learners struggle to understand and make meaning of the language in the mathematics. These were their concerns:
They have a firm understanding in the class, when they talk to each other you can see that they know what is going on…but in the exam, I don’t know, all knowledge gone out the window I tell you…why, because they cannot write out their answer. [S2T1]

Ngeke bakwazi ukuyibhala, ngoba ngela bakwazi ukuyifunda nokuyiqonda…emibuzwene kunamagama amaningi anolwazi kodwa asangakwazi ukukuhlangoana. (They cannot write it, because they cannot read it and understand it…in the question there is too many words with information that they cannot link.) [S1T2]

Their answers are yes or no, to a question that does not want a yes or no, then you know they have not understood it therefore they cannot write it. [S1T3]

Linked to the learners’ poor writing skills, the teacher participants emphasized that the learners also struggled with copying, transcribing and working with general mathematical formulae. This was evident from these comments:

It is given as data, the formulae, learners only have to copy it and substitute values, but it becomes difficult. [S2T3]

I think we tell them about what to watch out for, and then they become too careful and look at these problems suspiciously and then they cannot do the calculations. [S1T2]

In the class they are getting it correct but otherwise in the tests the cannot work with the mathematics. [S3T2]

I can see them (learners) not writing and constructing the right answer…they are using only the numbers given. [S2T2]

The teacher participants also viewed the poor copying skills in ML as a direct result of the poor execution of the reading skill. Learners’ lack of the reading skill was recognized when teachers observed the way in which they read and responded to content and context based problems from the textbooks, prepared worksheets and past examination papers. This was noted in comments such as:
I cannot see how my children get this wrong, I tell them follow the formula, then take the numbers and put it there, even if you can't read...all you need to do is put it in, substitute it. [S2T3]

They are not reading it or reading too much into the word problem and therefore they are doing it wrongly. [S4T1]

Some teacher participants also added that their own poor intonation of the English language or their accent could make it difficult for learners to hear what is said by the teacher.

Ay...The English pronunciation is difficult, you have to be clear in the way in which you speak or else you are misunderstood...My accent does not help much to develop these skills. [S5T2]

The children learn from what they hear, the problem starts there, I talk with an African tone, so maybe this is a problem. [S3T3]

Teacher participants highlighted that many language literacy skills start with the listening or hearing skill such as, repeating the words mentally, then writing the information using its correct spelling and understanding it. Teacher participants have cited the following comments:

Listening is affected and their interest in learning is affected...these children only hear English in school. [S4T2]

Children learn to read, write and understand from what they hear. [S5T2]

When I (teacher) talk in English, I can see that they are struggling and I feel that they are not really listening...I lost them. [S4T3]

A number of difficulties with the language literacy skills such as: fluency; comprehension; writing; reading and copying contributed to the teaching and learning problems experienced by the ML teachers in secondary schools. They raised the issue of learners' difficulties with English language literacy skills such as:
Research done by Macdonald (1991) addressed the nature of language and learning difficulties of young African learners in South African Primary Schools. The mastering of complex, abstract or academic concepts in an inadequately known FAL English is always problematic. Other research that concurs with Macdonald (1991) is Cummins’ notion of cognitive academic language proficiency (CALP) which occurs in a formal situation such as a classroom or other academic setting. In this situation the content is more abstract and unfamiliar to learners. Cummins (1984) emphasises that the language itself in the content carries all the meaning and there are less clues within the context. The learner cannot make meaning of the question because the language is unfamiliar and abstract and to cope with decoding both content and context at that level becomes difficult. The abstract terms presented in the content or question are not part of the learners’ everyday life (to compound the problem more – the abstract terms are in the learners first additional language – English), they have to use their knowledge from their background to make connections with the content.

3.2.2. Emotions such as helplessness, loneliness and hesitation – Teachers’ views

This category was identified from the teacher’s responses only and can also be described as a lack of confidence in their communication. Many teachers agreed that there had been a considerable improvement in their language communication in English (LoLT) over the past years, in post-apartheid S.A. However, it was still common for them to feel a sense of helplessness and loneliness in their quest to strive for academic success from their learners in their classes. These were some of their comments:

Learners are able to follow my explanations in English… but I feel as though I am alone in my struggle..., they still cannot do well and then they (learners) blame the language in the exam papers. [S2T3]
The children they sometimes tell me, I mean ask me to explain again…repeat in another way…I don’t know in English how to say it again…I can use another example but they want to get that one…I feel hopeless. [S3T1]
I ask others in the class to help and expand on what I said, they stand up and take me over. [S2T1]

However, some teachers felt that there was hesitation in their own communication of English to the learners and struggled to express themselves in that language. This was evident from the following comments:

When I read in English, I have to internalize these concepts in my home language isiZulu first, I think about the best way to explain it to the children in English. [S5T2]

Kuyinsilelo yangempelu kimi uku humusha ekhanola anduba ngi khulume. (It is a real challenge for me to translate in my head before I speak.) [S4T1]

Wow, all those English words and concepts flying in my mind – back and front, okay first it is in English then in isiZulu, then back in English and say it in English. [S4T2]

My learners are always asking me, mister, why you take so long to answer. [S3T1]

However, a teacher participant was clear that her hesitation did not mean that she did not understand, but rather that she was assimilating the information and thinking of the best way to explain it to the learners. This is what she had to say:

Wait, I have to say it in a way that you will understand, that is what I tell the learners when we are discussing a solution, I know my work but I hesitate…because I have to explain it in the best way for them (the learners) to understand me well. [S4T2]

The findings of this study were consistent with that of Wenger’s (1998) theory of a community of practice where learning is central. According to Wenger (1998),
learning is a process of co-participation within a community and can be described as a regular interactive process where members share a concern for something they do and learn how to do it even better. Although the teachers were emotional, they were within a community of practice where all forms of participation in the language of choice entailed learning.

3.2.3. Setting and context – Teachers’ views

Some of the teacher participants also admitted that there was dual use of languages between English and isiZulu depending on the situation. They indicated the different contexts in which they used English and isiZulu. This is what they related:

It is true, when I am in town talking to my Indian or a White friend then it is English only and here in school or at my home or church it is isiZulu. [S2T1]

I use English to reprimand my own children at home, then they know that I am serious. [S4T3]

I mainly use English only at school or if I go to a cluster moderation meeting. [S3T2]

I don’t have a problem, I can speak, write, read, listen and understand the English language very well, I am not afraid of using it anywhere, …I do this around school so that the learners will hear me in school and feel good that I am their teacher and is very knowledgeable. It also encourages them to speak English with each other as well if they hear me. [S1T2]

I do buy English magazines and newspapers so that everyone in my home can read it as well. [S3T1]

Some teachers revealed that they mainly used English only when it entailed the clarification of specific mathematical concepts and to understand the contextual word problems that are unfamiliar to the learners.
I use English throughout my lesson, these children must become familiar with the use of the language for the learning of the concepts if they are going to be successful. [S1T2]

I am always teaching in English when it comes to the new context like, e.g., when I saw the wind turbine example, it was a new thing because learners do not see these things, I explained to them in English only and they understood. [S2T2]

Within a South African ML classroom, some teachers want the children to use English when explaining their mathematical reasoning because the teachers feel that if these learners are denied the chance of becoming fluent in English, which is an international language, they may not be able to participate with other people outside the classroom setting (Setati, 2005a). However, it should be noted that almost all teacher participants declined to elaborate the reasons as to why there was dual use of the languages. Since no response was given by the participants, I rephrased the probing question in the hope of getting an answer. There was hesitation from some of the participants as though they wanted to explain further but eventually they answered, “No comment”. I declined to pursue the matter as the body language of the participants did not seem approving. However, a teacher participant went on to describe that it was the people’s perceptions about the intelligence of an individual based on English language competency or just a feeling of being excluded from a conversation. He made the following comment:

You see it is all about perception, this power of this language English will always be there, even our illiterate parents are aware of it, they emphasize the importance of the English language when they cannot speak it themselves. This is still the situation now. You are clever if you can speak English properly and then if you are a teacher then you should only speak in English. That is the way other people see it. If you are in a conversation with people talking in English, then you have to listen and talk the same, in the same voice or else you are left out. [S3T2]

Studies by Gee (1994) and Setati (2005a, 2008) on the language practices of teachers in multilingual/cultural mathematics classroom reported that language in its spoken and written form was always political. Language was not just a cultural tool
but also a political tool that was used to bring about the identity of an individual that is engaged in a situated activity (Gee, 1994). Thus, the teachers’ decisions in this study about which language to use, and how and when to use it, reflect their identities and activities that is supported by prior researchers. Central to Wenger’s (1998) theory of a community of practice, is that identities can be multiple and connect to the individual’s social and cultural practices. According to Fairclough (1995), institutions impose upon individuals their ways of thinking and seeing. In this study this means that the multilingual/cultural classrooms impose particular identities which shape and are shaped by individuals as they enact them.

Wenger, McDermott and Snyder (2002) further elaborate that a “community of practice has an identity defined by a shared domain of interest. In following their interest in their domain, members engage in shared activities and discussions, helping each other, sharing information and knowledge” (p. 27). For the FAL English ML teacher this involves that the acquisition in the subject’s ways of learning, talking and valuing things as a mathematics teacher in South African bi/multicultural classrooms. This shared knowledge between the teacher and learner as highlighted by the teacher participants is needed to participate in that social practice where language is used as a tool to the building of knowledge.

3.2.4. Language literacy skills – Learners’ views

This category of language literacy skills from the learner participants includes skills such as: fluency; understanding, comprehension and interpretation of the LoLT English; reading, copying and transcribing which were identified as sub-categories from the data. The findings of the learner participants correspond with the findings of teacher participants as previously mentioned already when they expressed their concern about the usage of English as LoLT as they struggled to express themselves in that language. The following comments confirmed their concerns:

It’s about being able to be fluent in English, that is my challenge. [S2L1]

I only use English in my learning because I have to…my exams are in English so that is why I even try harder. [S3LI]
Learners described their experiences that illustrated their uncertainty about the English language, whether they understood it well enough to engage with the ML concepts that are embedded in the context of the word problems. These were their comments:

- It is difficult for me to understand the language that I learn in at school. [S4L2]
- Since we are using English for our learning,…even in our testing…but we don’t understand everything and…our marks are so bad. [S4L3]
- I waste a lot of time trying to understand the question, and when I finally do my calculation it is wrong, I misunderstood the question completely. [S5L3]

Some of the learner participants have understood the relationship that exists in the “interplay of the context and content” of the ML curriculum through their daily communication with their teachers (Brombacher, 2007). These responses by the learners indicate their awareness of the skills that they should possess to understand and thus be successful in ML. These were their responses:

- We know that to be successful you must be able to be good at the concepts in maths as well as be able to be good at the literacy in the problem. [S2L5]
- I know that the curriculum of ML is demanding in its way (skills) that we work with it. [S4L4]
- Our teacher tells us that ML is about context and content, the situation is explained and we must use our maths understanding to solve the questions about that situation. [S1L5]
Some of the learners blamed their poor language skills such as, comprehension and interpretation of the LoLT English, for their poor performance in ML. They added the following comments:

Interpreting information done in English in ML as our way to our education is challenging. [S2L1]

Those maths problems in paper two is long, its like comprehension, a English class as well as a maths class together…I know what to do at the start but by the end of it I got lost somewhere…I then look at only the numbers. [S4L2]

Some of the learner participants have realized that their own reading skills in the English language is questionable and have thus acknowledged that their teachers encouraged them to read in English because they (the teachers) identified their poor reading skills. These were their comments:

I get it all correct in the class, but in the exam I can’t read the question, I am a different person…What happened to me? [S4L3]

Our teacher is saying that we should read more often in English. [S2L4]

My ML teacher says that our reading skills in English will not be an issue if we do more reading. [S3L1]

Learners have expressed their concerns about their capabilities in copying and transcribing ML formulae and concepts that are expansive in the ML curriculum. Some of these comments were:

It’s a matter of identifying the correct variables in the problem and using it in your formula provided but I always get these wrong, that is a problem because it is always in our examples that we learn. [S2L1]

I just have a problem copying down the formulae. [S3L2]

I know that I must divide by 2 for a semi-circle but I don’t do it. [S4L1]
It can be noted that the learners’ responses indicated that their poor English language literacy skills contributed to their poor achievement in ML. According to the literature, Cummins (2000) describes that learning involves becoming enculturated, whereby a learner finds that learning is marked by the use of conceptual tools like language. The learner participants who shared their experiences described several challenges that they faced with the poor English language literacy skills such as: poor writing, talking, reading, and comprehending and interpretation skills.

These findings tie in with the research described by Vygotsky (1962) where a developmental process in the learners is a shift from external egocentric speech to internalised inner speech. In his studies the reference of “speech” does not refer to the category of speaking but rather the literacy skills acquired through formal learning (Vygotsky, 1962). Furthermore, Vygotsky (1962) observed that an explanation of one’s thoughts becomes difficult as we try to verbalise them into sentences. This is a reality for many teachers and learners as they (the teachers and learners) struggle to find the words to provide an explanation of knowledge that is clearly understood. Vygotsky (1962) concluded that inner speech is:

… a distinct plane of verbal thought … the translation from inner speech to external speech is not a simple translation … It is a complex, dynamic process involving the transformation … of inner speech into … speech intelligible to others … (p. 148)

In the case of South Africa, FAL English learners experience this shift when their formal learning takes place in LoLT English and a translation internally into their home language.

3.2.5. Poor mathematical skills – Learners’ view

Alongside the difficulties and challenges that the learner participants highlighted with the English language literacy skills, were the poor calculating skills and mathematical reasoning skills that they possessed. Some of the learner participants felt that English as a LoLT in ML was the reason for their underachievement in ML. Their mathematical solutions were incorrect because the questions to problems were misunderstood. These were their comments:
The mathematics in ML is challenging to me and then I also have to be skilful in English to balance my work. [S2L3]

I cannot reason with the maths in paper 2 because of the strong language used, I am weak with the maths and the language English. [S4L2]

I am not successful in my answers because of my poor knowledge of the concepts because I cannot relate it to what I am supposed to do. [S5L2]

Some of the learner participants provided opposing views with the above learners citing that it was their poor English language literacy skills only that resulted in their poor academic performance in ML, and they expressed that they possessed a fairly good level of mathematical skills. These learner participants believed that language proficiencies and mathematical skills were separate entities. These were some of the opposing views:

I can perform most of my calculations correctly...English language does have an effect on me in the class, but we need it and it has nothing with my maths work. [S4L2]

My teacher always helps to make me understand, I am good in my maths, the English used does affect me in my answers in class, it is that part that challenges me. [S1L3]

Angisiqondi isiNgisi njengoba kwenzeka nqazi izsbalo zami. (I just don’t understand the English, my maths like I know.) [S3L3]

Maths I am good at, eh...very good...English I am getting there ...slowly. [S5L1]
Slowly I need to start looking at my work in English...I struggle so I try to use isiZulu to get to my answer…I get it right, but it takes a long time…but I know my maths, so this helps to get it right. [S4L5]

While some learners described that both their poor English language literacy skills and poor mathematical skills were the reason for their poor achievement in ML, other learners expressed that they possessed a good level of mathematical skills but poor English language literacy skills only. It is from this notion that we can tie
this study to the literature and what the DBE policy documents are saying. With the new curriculum guidelines CAPS (DBE, 2011), emphasis is now placed on progression in ML, which occurs on three levels: content; contexts and confidence in solving problems. What does it mean to work with these three levels of ML? What role does language play in the knowing of these three levels? Setati (2005) explains that in the relationship between language and mathematics, language serves as a medium through which mathematical ideas are expressed and shared. Lerman (2001) also describes that language plays an important role in the genesis, acquisition, communication, formulation and justification of mathematical knowledge and knowledge in general.

3.2.6. Context and setting – Learners’ views

From previous transcripts, learners admitted that the common feeling was to value the use of the language English. However, they commented that they did shy away from using English during their lunch breaks, at home or in their neighbourhood with each other. This is what they added:

I don’t use English with my friends, it is ok for the class, and maybe for a job but I don’t want to use it around my friends. [S3L1]

We can use it in the classroom because we have to learn in English … it is like safe to use it in the class. [S4L3]

Learners felt that English was reserved for the classroom only. They were more comfortable using their home language isiZulu with their friends and family members.

It is comfortable to talk in isiZulu with my friends or otherwise we have to think how to say or talk things in English. [S4L5]

At home we are all talking in our home language, isiZulu. [S4L1]

The reason for the choice of communicating with their home language over English at their home, out of the class or in the neighborhood as well as using English LoLT
in their classrooms was in keeping with the findings of the literature in this study. It is the way in which learners use language that influences the core of their learning. Cummins (1984) describes language use through his quadrants, as illustrated in Figure 5, page 42. He suggested that there are different contexts in which different kinds of language proficiency occurs (Cummins, 1984).

3.2.7. Stigmatisation – Learners’ views

They also revealed that the stigma attached to isiZulu learners speaking English socially was like social suicide.

That is like the end of me, nobody will want to associate with me after that, I will be too white for them. [S2L4]

It will be like death for me, like I have died you know, I will have no friends if I only want to speak in English. [S2L1]

Some of the learner participants, in their own understanding, have grasped the idea of wanting to learn in English, but are reluctant to communicate using English and isiZulu alongside each other. There were mixed messages coming from some of the learners as they tried to balance the importance of learning in English and not having the opportunity to engage with the English language out of the classroom together with their home language. They have shown opposing views to the use of English. These were some of the opposing comments from the learners:

It is not so easy, I know that it is important to learn in English and to talk more in English will make me smarter and my friends know it but it is different when we are together, they will laugh at you and not talk back in English, then you get the message. [S4L5]

It is a challenge out there, the older children will laugh and call us names, even some of the older people stare at us in the taxi if we talk in English. [S3L1]

Other children think that we are trading isiZulu for English and that is why they always tease us and make fun of us. [S2L3]
These perceptions and experiences that the learners have described are an indication that they value their home language to be able to fit into their immediate society which is a positive sign. Burkett, Clegg, Landon, Reilly and Versters (2001) state that if the visibility of a home language is seen as a practical medium for learning and this notion is publicised to parents, teachers and learners, then the attitudes towards learning in an additive bilingual context will change.

3.3. Theme 3: Classroom strategies and solutions – Teachers’ views

The questions for the teachers in the interview protocol that were used to elicit findings about the classroom strategies and solutions were:

- Do you provide learners with opportunities (lesson strategies) to talk (exchange ideas), discuss, argue and engage in conversation when you teach? How do you do this during your lesson?

The categories below that were identified from the data speak to the theme, classroom strategies and solutions, which were identified from the literature.

3.3.1. Effort

Some of the teacher participants indicated that they identified and recognized the learners’ needs and challenges with the LoLT English. The following comments revealed their concerns:

We can see these challenges in our classrooms with the LoLT, and we have to help our children. [S1T3]

If I see a problem, then I must make a plan to help that learner. [S3T3]

It was evident that FAL English teachers have recognized that the learners need assistance in their learning of ML in LoLT English. They have indicated the effort that they make to close the language gap that exists in their ML bi/multilingual classrooms. These types of effort come in the assistance and support that the
teachers have described in their teaching. Some of these descriptions illustrate their effort:

When I have to talk in English, I always have to dig into my vocabulary and think about what words I have to use to construct a sentence that will be logical to a learner who is needing the help. [S4T1]

I tell them where they are wrong, so that they can try again. [S1T1]

The teacher participants have further elaborated about their attempts in supporting the learners in their need for assistance, by providing the following data that also relates to the next category of creating a positive climate within the bi/multilingual ML classrooms.

3.3.2. Forming an ML classroom into a community

Some of the teachers have explained some of the positive reinforcements that they have used in order to develop a positive classroom climate for their learners. These were their explanations:

I do not tell them that they are wrong because learning in English is challenging for them, but I guide them to the correct thinking that will lead them to the right answer. [S5T2]

We work together with the tricky language in the questions and the answers, they know that I am there to help them, I want them to believe that they can be accurate. [S3T1]

I am always giving them good words about their good work, like ‘good work Thembinkosi’ and ‘I am so proud of you, you have done it well’…my children like that, it motivates them and keeps their spirit alive. [S2T2]

The teacher participants have also differentiated between the types of encouragement that is provided in their classrooms. This is what they added:

I allow the learners to choose their own partners to work with, in this way they are
happy and it encourages them to engage in talk. [S4T1]

I encourage the children and probe their thinking. [S1T1]

I encourage the learners about being able to feel comfortable and express themselves in my class. [S1T3]

The teacher responses in this study embrace and reflect the practices portrayed in the literature. Vygotsky (1978) emphasizes that all good learning occurs within a child’s zone of proximal development (ZPD). The identified practices in this study illustrate the several ways that a teacher can do this such as: giving encouragement and praise for small gains, and involving and probing learners to speak about their thoughts. Language practices such as code switching, translation and revoicing form the next categories within this theme (Moschovich, 1996, 1999; Setati & Adler, 2001; Setati, 2005a, 2008).

3.3.3. Code switching

The teacher participants have emphasized a common strategy used by themselves is code switching. Teachers have expressed their use of switching between their home language isiZulu and English in their teaching of ML in their classrooms. When dealing with mathematical concepts they using English and isiZulu in their explanations. These were the explanations of some of the teacher participants:

I am explaining about area calculations and I say “At this point we have the length of the rectangle and here is the breath, kufanele siboneukuthi basezigabeni ezifanayo kuqala (we now see that they in the same units first), then we substitute into this formula”. [S3T3]

I use isiZulu in my explanations together with English. [S3T1]

I use our home language isiZulu with the LoLT English, switching between the two. [S3T2]

The teacher participants expanded on reasons as to why they used code switching:
To drive this point, I say it in isiZulu, just to make sure they know it and have grasped it. [S3T3]

It comes to me naturally, it is not something that I planned to do..code switching. [S1T3]

It is our mother tongue and I think this practice will help our learners. [S4T2]

I am using our home language as a resource that supports their learning. [S5T3]

The reasons given by the teacher participants is in agreement with the studies conducted by Setati (2005a; 2008) and Rose and van Dulm (2006) where they highlight that code switching is a common practice, knowingly or unknowingly, that is used as a strategy in multilingual classrooms. In this study, the teacher participants have expressed that the home language isiZulu is seen as an opportunity for FAL English teachers to use as a resource that supports the teaching and learning of ML. This study highlights and concurs with Vygotsky (1978) again when the language becomes a tool to support learning within the child’s ZPD.

Teachers have also highlighted that participation from learners is very limited during classroom discussions, especially when learners have to interact with the teacher using the LoLT English. These were their comments:

I have to code switch during my discussions to get some participation from the learners. [S4T2]

There is no or little interaction in the class when I teach in English only, that is why I have to use English and isiZulu simultaneously in my teaching. [S1T3]

Some of the teacher participants did raise their concern that they were doubtful about using code switching as it had more disadvantages than advantages. These were some of the disadvantages that they mentioned:

By using both isiZulu and English in my explanations I don’t know if that is correct because their LoLT is English and their assessment is in this language. [S2T3]
By code switching I am not giving them the opportunity to expand their knowledge of English. [S3T3]

And these were some of the advantages that they mentioned:

By using code switching I am allowing a child to build up and connect the missing pieces in his learning and knowledge. [S4T3]

The children are grasping the mathematical concepts when I code switch. [S5T3]

The disadvantages put forward by the teacher participants reveal the same sentiments as Setati (2005b) where she reveals that teachers’ use of code switching extensively in their multicultural classrooms brings about feelings of guilt because the teachers believe that they are denying the learners an opportunity to acquire English. Adler (1998) also describes it in her studies as the dilemma of code switching. The advantages put forward by the teacher participants also reveal the opinions of Rose and van Dulm (2006) in which their research show that code switching fulfils a purpose of clarifying, confirming and the expansion of ideas in classrooms which may aid teachers and learners in attaining their academic goals.

3.3.4. Translation

Another language practice that was mentioned by some of the teacher participants was translation. They used this strategy extensively in their ML classrooms as a coping mechanism for the learner’s lack of the English literacy skills. These were their comments:

It is helping them to manage the language by translating the difficult English parts into isiZulu. [S2T2]

They speak in isiZulu, I don’t stop them but I tell them (translate) in English what it is meaning. [S1T1]

I confirm their questions about certain concepts in English, they always ask in isiZulu. [S2T1]
My learners always communicate in isiZulu even if I discourage them, they learn better though in this way especially when I explain their isiZulu explanations in English. [S5T2]

However, the teacher participants did express their concerns about the shortcomings of the translation especially when some concepts in mathematics cannot be translated into isiZulu. This was clear from some of the following comments:

I try my best to explain, but sometimes it cannot work, there is no word in isiZulu for a mathematics concept like “parallelogram”. [S4T2]

As much as I am helping by translating into isiZulu, …I think about this when I struggle to get the mathematical concepts into isiZulu. [S2T3]

These findings were consistent with language specialists (Herbert and Bailey, 2002) who say that academic English is from such a different foundation than the indigenous languages that there is no transfer, especially in the fields of science and technology. Foley (2003) also asserted that if the indigenous African languages are to be implemented as academic languages of learning and teaching, the standard written forms need to be “modernised, regularised, codified and elaborated” (p. 2).

3.3.5. Revoicing

Some of the teacher participants have described incidences of using revoicing as a strategy in their bi/multilingual ML classrooms. These were their descriptions:

I listen to and work with the learners’ mathematical language and help them by communicating it in the appropriate mathematical language that will make them understand better. [S1T3]

I ask learners to listen to the discussion and ask another learner to take certain parts/concepts and say it in another way using the correct mathematical concepts. [S2T2]
I am showing the learners the correct language and correct grammar in the questions so that they can calculate properly and not make the same mistakes. [S5T2]

In the South African context where learners have less fluency with the LoLT English, there are more demands on the FAL English teacher for revoicing mathematical English. The findings in this study illuminate the findings of Moschkovich’s (1999) study in the USA where the teacher’s strategy of revoicing played a significant role in the acquisition of mathematical language, thus, the teacher enables access to English, mathematical English and the ways of talking mathematics in school.

3.3.6. Group work

Some of the teacher participants shared ideas about how they encouraged learners to talk to each other when placed into groups. These were their descriptions:

I tell learners in their groups that they can use isiZulu to support and clarify their understanding with each other. [S3T1]

I make several groups of 4 or 5 learners so that I have more control of their dialogue and everyone is busy in dialogue. [S4T1]

They highlighted their positive interactions with the learners when they moved around the classroom to the different groups to facilitate learning:

When I am moving around, I can hear them in their groups, I interrupt and question them just to make sure that they have not gone off the topic. [S5T3]

Sometimes the children in the groups call for my assistance. [S4T1]

In agreement with Vygotsky’s (1978) and Brufee’s (1993) research about the role of group work, some of the teacher participants in this study revealed that their strategies included learners’ exposure to group work. According to Vygotsky (1978) the learners also have a very important role to play in their own learning, which emanates from their interaction with each other.
Vygotsky (1978) observes that assistance in the ZDP may occur under adult supervision or “in collaboration with more capable peers” (p. 86). It is valuable for learners to try out their ideas with their classmates first when they are solving problems, before expecting them to speak to the whole class. Bruffee (1993) says the following, “a group that includes diverse experience, talent and ability, people’s ZPD overlap. I may already know a good deal more as a member of a working group than I would be ready to understand by myself alone” (p. 39).

However, some teacher participants contributed some opposing views to group work. These were their comments:

I do not have time to engage in group work. [S3T2]

My learners are too many in my class to effectively do group work. [S2T1]

They acknowledged that group work was an essential strategy to use but cited that group work was not successful in their classrooms. These were their challenges that they described with group work:

Group work requires a lot of patience and can be useful, but sometimes they want to talk about other things, it does not work. [S1T2]

Group work is good if you have small classes but in my class there is too much noise and no control of the learning goes on. [S5T1]

I have 51 children in my class, … it is impossible… a good day with that class is when 10-15 of them are absent which is like on a Friday. [S5T1]

However, these findings of this study contrasted with the fundamental principle of learning in the classroom which is group work (Vygotsky, 1978). The basis of Vygotsky’s theory (1978) on collaborative learning explains a set of instructional strategies in which learners work in small groups to help each other learn. He emphasises that schools and teachers should make cooperative learning a fundamental part of their instruction. In a South African classroom, the bigger picture
includes the learners using their home language to interact and the teacher embracing bi/multilingual teaching. This is also supported by the LiEP in which the underlying principle is to maintain the use of home language as the LoLT (especially in the early years of learning), while providing access to an additional language(s) (DoE, 1997, p. 6).

3.3.7. Discussion

Some of the teacher participants elaborated about the discussions that followed the group work. These were their elaborations:

Learners are discussing with each other using isiZulu and English in their mathematical reasoning. [S2T2]

The chosen leader of the group puts forward their group discussion and the whole class is involved in this discussion afterwards. [S4T1]

This is when I get a chance to solidify the mathematics concepts with them, I give them a chance to think about what they are saying in their discussions. [S1T1]

The teacher participants also spoke of the benefits of general discussion about language practices in the ML class. These were their utterances:

An ordinary topic on statistics, for example, can get learners into a discussion about what they know and what they have seen. [S4T2]

A class discussion allows me the teacher to evaluate how much a child knows and how much they don’t know. [S5T2]

Learners are more participative when there is discussion using their isiZulu and English, they seem to grasp the concepts better. [S5T3]

Vygotsky’s (1978) research revealed a developmental process in children when a shift from external egocentric speech to internalised inner speech occurs. In the South African context this shift can be inferred when formal learning takes place in LoLT English and a translation internally into their home language. This is a reality
for many teachers as learners struggle to find the words to provide an explanation of knowledge that is clearly understood. In an earlier research, Vygotsky (1962) emphasised the need for learners to have a great deal of opportunity to be able to translate and verbalise their thoughts into speech. These findings in the data were similar to these researchers in the literature. The teacher participants have to think about the various strategies that can be used to encourage the expansion and exploration of ideas in their classrooms. Teachers need to plan and prepare appropriate classroom activities to provide opportunities for their FAL English learners to talk about their learning.

3.3.8. Involvement in the teaching and learning activities

Some of the teacher participants also mentioned the ways in which they were involved in the teaching and learning activities with some strategies that are worth taking note of, such as: providing short exercises to increase the learners’ fluency in English. These short exercises included items like, correcting the spelling, and increasing the learners’ English vocabulary by defining keywords of the mathematical language.

I also ask them to correct the spelling of wrong words which I take from my dictionary. [S4T2]

We are always adding to our vocabulary, these children need all the help, at the back of their books I ask them to write the meanings of new words that we see in the questions like trends or mortality, so if they can go back to them in the year. [S3T2]

I know that my children are having problems with the language of English, everyday I give them about two or three words to bring the meaning in the next day. [S2T3]

It also included strategies such as: finding pictures or articles that relate to specific topics in mathematics.
Let us collect pictures about percentages, where we would use it or where you have seen it being used. [S1T1]

I ask the learners to cut out from the newspaper, the articles with the different graphs and bring them to class. [S3T2]
Sometimes I say to the children, let us all think about words that we use to give direction or let us collect pictures about percentages, where we would use it or where you have seen it being used. [S2T3]

A particular teacher discussed the way in which she would take five minutes at the beginning of every lesson to talk about what the learners have read in the newspaper or heard on the news over the radio or television. This discussion would take place in English only and learners were encouraged to bring pictures of their articles to class with them. She highlighted that this has worked quite successfully and had recommended it to other colleagues.

My lesson starts off by asking learners to share what they watched in the television news or what they heard on the radio… or what they read in the newspaper…, some of them bring the articles to school, it takes only 5 minutes and the children tell their stories in English, it is good because it increases their thinking in English, I have given my ideas to people from the other school. [S4T2]

Another teacher participant added that he would design charts for his classroom that were bilingual. This strategy was voiced as follows:

I also make my charts in English and isiZulu, especially on the topic that they are having problems in, like percentages and taxation, these children use the work. [S5T3]

Some of the teacher participants highlighted a strategy that incorporates the use of visual stimulation that they used as a coping mechanism to increase the learners’ fluency in the English and mathematical language. These were their descriptions:

When questions in ML are too long like the ones in paper two, I replace or support the questions with diagrams and drawings. [S5T2]
I like to use visual stimulation, so I tell learners that the word problem is like a story, create a picture in your mind or draw pictures and diagrams to understand it. [S4T2]

Two teacher participants from different schools have implemented the same strategy to increase the learners’ English fluency by creating a library corner in the class. They mentioned that they collected old books, newspapers and magazines in the language English to add to the library corner. These were their descriptions:

When I go shopping I am always taking those free magazines that they give and I collect old newspapers from my neighbours and friends. [S1T2]

I have created a library corner in my ML class, all my children use it, they read the books there. [S1T2]

I had the old books, even my university books are there. The children read it. [S2T2]

I ask children to bring any reading thing but I don’t think they have them. [S1T2]

Although the teacher participants did not use the term scaffolding in their responses, they did embrace the perceptions of scaffolding by highlighting the strategies described above. Scaffolding as described by Mercer (1995) refers to the support provided by the teacher such as words of instruction, worksheets, explanations, or other support material to enable a learner to accomplish their activities with success independently, at their level of proficiency.

The findings of the data in this study as the above categories tied in with this theme, classroom strategies and solutions, which were deduced from the literature. To summarize the theme, Setati (2005a) describes that for learners to successfully reason mathematically they need to communicate in their main languages; however, to meet their aspirations in the workplace, they need to learn the discourse of mathematics - the ways of talking about mathematics, listening to mathematics, acting in a mathematics class or in the community, interacting mathematically, believing, valuing and using mathematics. This development can only take place through the conscious guidance of the teacher, who is the mediator of learning and
fosters the development of a community of practice in a classroom (Mercer & Littleton, 2007).

3.4. Theme 4: Need for Support – Teachers’ views

The research questions for the teachers in the interview protocol that were used, which led to this unexpected theme, the need for support, were:

- How do you feel using English as a medium of instruction and for assessment in your mathematical literacy classroom? From the response - probe further to ascertain specific reasons and further question the acceptance and advantages of English as a LoLT.

- Do you provide learners with opportunities (lesson strategies) to talk (exchange ideas), discuss, argue and engage in conversation when you teach? How do you do this during your lesson?

Instead of the teacher participants answering the interview question directly, their responses reflected new emergent categories that highlighted their need for support. The categories below that were identified from the data, speak to this theme.

3.4.1. Lack of in-service training

Some of the teacher participants expressed their concern over their lack of in-service training especially since they encounter severe challenges with the fluency of the English language with their learners. The type of in-service training they voiced was not on content but more on English fluency. These were their comments:

The DBE needs to have more workshops on showing us the teachers how to develop the English language skills better in our ML classrooms. [SST1]

I think I will benefit a lot from more programmes at universities but not on ML content but rather with English language too because I am not so good. [S1T1]
I struggle with the English as well, these workshops will be able to develop my English skills as well. [S1T3]

The teacher participants further highlighted that in-service training should be an ongoing process by the DBE and thus indicating that the DBE recognizes their challenges and are willing to provide support and assistance.

The subject advisors should be always calling us for regularly for workshops. [S3T1]

By choice of us the teachers we should be exposed to programmes throughout the year. [S4T3]

However, some of the teacher participants shared feelings opposing the above findings. Many teacher participants were involved in several in-service training programs. They praised the in-service training programs and workshops to reveal the positive help, support and development that it offered. These were their comments:

Workshops are there to help me to develop mathematical competence … we must thank the DBE for supporting us. [S4T1]

We are guided and aided by our university courses to work in the LoLT English. [S5T2]

My courses are developing my own fluency in mathematical language. [S2T2]

Another category that was identified and very closely related to the category above was the lack of professional development that educators possessed with regards to ML.

3.4.2. Lack of professional development/qualification in ML

Most of the teacher participants in this study were in possession of a valid teaching qualification with numerous years of experience as indicated in Table 3 from the
previous chapter. However, they expressed their concern over not having a sufficient qualification and development for ML. These were their concerns:

My last certificate was 11 years ago, my certificate in Biology, I think that I would be better in my class if I could get an ACE in math lit. [S3T2]

My mind is there to go to study more because I have only a teacher’s diploma in Geography and now I am doing math lit for 2 years…it is not easy. [S5T1]

I was teaching biology before now I am in math lit, I like it but they are very different, I feel like I am teaching English too, there is so much context to understand first, I need to get the ACE for ML. [S1T3]

Some of the teacher participants voiced their disappointment with the department for not providing sufficient opportunities for teachers to obtain professional development. These were their utterances:

I feel that the department should provide us with more opportunities to develop further… that would definitely improve us as teachers and therefore our children will do better. [S1T3]

The DBE has to be more involved in our development as competent maths teachers. [S5T1]

They stated that the training programs for the ML introduction and orientation were too short, too quick and did not include many of them at that time in 2006.

The government has given training for ML only in that year when ML was new [S5T1]

That training that we did in 2005 and 2006 was not enough…it was too short to develop us in a completely new learning area like ML. [S4T2]

What about me, I am only doing math lit now, I did not go for that training. [S5T1]
Some of the teacher participants complained that even the opportunity of completing an ACE in ML with the government bursary in 2006 was restricted only to two teachers per school at that time. The participants strongly voiced that those teachers have long since left the school:

When I told my principal that I wanted to go for that ACE programme that the government was paying for, he said that he had to give 2 names only, I was too late. [S5T1]

That was unfair, you are having a development in the subject ML with an ACE and then you leave with it…then I came here in the subject ML from physical science and I have no qualification. [S4T3]

They further elaborated that these professional post-graduate studies should close the gap that they are experiencing with regard to their shortcomings in working with language skills as well as mathematical skills in their ML classrooms. Comments in this regard were as follows:

I feel that a ML qualification will equip me with more mathematical knowledge in the LoLT English and I will be able to deliver a better quality teaching. [S4T3]

I believe that this sort of professional training will help me in the class to effectively teach using the LoLT English and the mathematical concepts. [S5T1]

The teacher participants were keen to embark on further professional development in ML specifically so as to equip themselves to successfully address all challenges and problems that they would encounter with the English and mathematical language in their classrooms. This can be interpreted that access to an appropriate course would be a panacea for all their challenges.

3.5. Theme 5: Experiences and involvement in the learning activities - Learners’ views

The research questions for the learners in the interview protocol that were used to elicit findings about the theme, experiences and involvement in the learning activities, were:
• During a mathematical literacy lesson, do you feel that you are competent in the LoLT English (capable, experienced and skilled) to cope /engage with the mathematical context and thereafter apply the mathematical content that is required to be successful in problem-solving? Can you expand by providing experiences in the mathematical literacy classroom that can substantiate the reasons for your feelings?

• How well can you understand, comprehend and grasp mathematical concepts in the English language to engage with the contextual problem-solving examples? Why is this so?

• What problems/difficulties do you usually have when understanding and calculating word-problems (mathematical language) in the mathematical literacy classroom?

• Does your teacher use code switching, (it is a term/strategy explaining the use of English and isiZulu in single utterances) in the classroom to bring about understanding during a lesson?

• Do you use code switching in the ML classroom? What are your reasons for this?

• Do you have a better understanding of the mathematical context, concepts and content in the word problem-solving in this way?

• How do you feel about the use of code switching that your teacher engages with in the classroom? Could you expand on your response by providing reasons?

The data in this study reveal the following categories that concur with the theme, experiences and involvement in the learning activities, from the literature.

3.5.1. Classroom climate

Some of the learner participants have described their experiences in their ML classrooms with learning in the LoLT English that indicates a positive classroom climate. Their comments echo the sentiments of the teacher participants in this study. These were their utterances:
Our attempts are not sent away by our teacher, our teacher provides us with encouraging comments, like, “let us try it in this way now and see what we will get”. [S1L1]

I can ask my teacher for help and she is always willing to assist me in my confusion. [S3L3]
My teacher praises us for doing well in our work. [S2L2]

Our teacher encourages us even when we are wrong. [S1L5]

The utterances of the learner participants in this study follow Wenger’s (1998) description of a community of practice. According to Wenger (1998) communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly. The teaching and learning of ML in a positive bi/multilingual ML classroom climate can be referred to as a community of practice.

3.5.2. Group work

Some of the learner participants mentioned their preference to engage in group work in the ML activities. They indicated that this allowed them combine their ideas, learn from each other and grasp the ML concepts easily. This was what they mentioned:

When I am in a group, I learn with the others from the others, and I feel I learnt the maths concepts better. [S2L2]

I prefer the group work, because it allows me to talk, listen and share to the others and combine our thinking. [S4L1]

The learner participants voiced reasons for their preference of group work that leads us into the next category, discussion.
3.5.3. Discussion

The learners indicated that within their groups they were able to engage in discussions that led to seeking clarity from each other and also building up of ML knowledge. These were their indications:

We can discuss our ideas in our group and I learn more from the others. [S4L1]

I don’t struggle when we are working in groups because we can discuss with each other to clear our confusions. [S1L1]

I have a better understanding when I am in a group discussing the work. [S4L3]

They also added the following comments about gaining confidence during group work discussions to engage with the mathematical language:

With each other, we can confidently apply our maths concepts with the ML problems because we have each other to check with our solutions. [S2L5]

I am more confident with the discussion because I have the support of my peers in my group. [S2L5]

The learner participants also commented on positive incidences of whole class discussions with the teacher outside of group work. These were their comments:

I am able to discuss with the teacher my misunderstandings, especially when I am struggling with some concepts. [S1L2]

We are together with our discussions in the class, the teacher is guiding us in our discussions. [S1L5]

Many of the learner participants indicated positively about discussion whether it was in a group or whole class discussion. The dialogue with the learner participants revealed the next category code switching.
3.5.4. Code switching

The majority of the learner participants articulated that they learn better when switching between their home language isiZulu and the LoLT English to support their learning. The learners felt that they could use their home language and English in their dialogue in the classroom simultaneously. This was what they voiced:

When I am explaining my thoughts, I am using isiZulu with the English together,….like an example, ngokwesibonelo laphe kunezibalo khona ze compound interest, ukuthola izinombolo, five years - uma kuyi compounded monthly ngiyazi ukuthi kumelwe multiplied by twelve first kuqal bese ngisebenzise formula. (the one with the calculation of compound interest, getting the number of years, 5 years – if it is compounded monthly then I know it must be multiplied by 12 first then put into the formula). [S4L3]

We are able to communicate the mathematics language better with the switching from isiZulu to English with each other in our group. [S3L3]
To be able to understand the maths concepts better and for my learning to be flowing I switch with isiZulu and English. [S4L5]

Many researchers have revealed that code switching is used as a teaching and learning resource for many learners in multilingual mathematics classrooms (Adler, 2001; Moschkovich, 1999; Setati, 2005a, 2008). These findings in this study were consistent with Setati and Adler (2001) who revealed that learners need to talk to learn and such talking to learn is a function of fluency and ease in the language of communication. On the same note, this study also radiates the sentiments proposed by Rose and van Dulm (2006) who expresses that teachers are to provide learners access to mathematical discourses, and in particular assist learners to develop formal written competence.

However, the learner participants expressed their concern that as much as they needed to use their home language isiZulu alongside the LoLT English to facilitate communication and understanding, their examinations was in the LoLT English. Therefore they were obliged to use the LoLT English as much as possible. These were their comments:
Code switching does give me a sense of being able to talk about the maths concepts but I must remember not to use it all the time, because the exam is in English. [S3L4]

I am two-minded about using my home language too much with my mathematics reasoning because in the exam I have to do it in English, I should be learning in English more. [S1L2]

The learner participants are in agreement with the teacher participants over what Adler (2001) has described as the dilemma of code switching. The benefits of code switching is identified by the FAL English teachers and learners alike in order to reformulate a question or instruction, or to re-explain or understand a concept, but it was the LoLT English that compelled them to use English as much as possible.

4. CHAPTER SUMMARY

In this chapter, I re-iterated the objectives of this study and described the process of analysis of the data in this study. I also reported on the qualitative data generated from the interviews of both the FAL English teachers and learners from the selected secondary schools. Although the majority of the participants conversed throughout the interviews in their home language isiZulu, all transcripts were presented in English via the translator/interpreter, with some original isiZulu quotations being illustrated. The findings and interpretation of the data were discussed as separate categories for the teachers’ views and learners’ views. These categories concurred with the common themes that were predetermined from the literature. Each category from each theme was discussed individually with accompanying quotations from the teachers’ and learners’ responses and also referenced within the context of the literature review.
CHAPTER 5

RECOMMENDATIONS AND CONCLUSIONS

1. INTRODUCTION

In this final chapter, the rationale and design of this study is reflected upon. I presented the main findings of this study from the themes that were drawn from the literature and expanded from the data collected in the previous chapter, which were: the power of English; language and communication; classroom strategies and solutions; and experiences and involvement in the learning activities. An emergent theme from the data, the need for support, was also included and described. The findings address the research question and sub-questions, which are repeated below:

The research question that was investigated is:

- What are the FAL English teachers’ and learners’ experiences and perceptions concerning the use of English as a LoLT in bi/multilingual ML classrooms?

The research sub-questions that emanate from the research question of this study are:

- What is the language of teaching and learning in bi/multilingual ML classrooms by FAL English teachers and learners and the reasons thereof?

- Do the FAL English teachers and learners feel that they teach and learn ML knowledge and skills better in their home language isiZulu or the LoLT English?

- What interactions (classroom strategies) within a community of practice do teachers and learners experience that indicate successful learning and teaching in bi/multilingual ML classrooms?
The limitations of the study are discussed after which recommendations will be suggested and conclusions will be drawn.

This study investigated the issues of the teacher and learner proficiency in the LoLT English and the academic literacy present in the inter-related nature of the mathematical content and context in the ML word problems by probing and eliciting the perceptions and experiences of the FAL English teachers and learners from five secondary schools in the rural Midlands area in KwaZulu-Natal. For decades now, researchers (Adler, 2001; Setati, 2005a) have been reporting on the role of language in the teaching and learning of mathematics. In particular, they have highlighted the effects of FAL English teaching and learning in bi/multilingual classrooms.

2. RATIONALE AND DESIGN

As noted in chapter 1, the main idea underpinning the ML curriculum is the inter-related nature of the mathematical content and context. According to Brombacher (2007), the word problem-solving that is part of the ML curriculum needs to be relevant and applicable to the learners’ real-life situation so that the context of the mathematical problem becomes a vehicle that makes meaning to mathematical knowledge and skills (content). Herein lies the problem or the challenge that South African teachers and learners are faced with. Instead of mathematical computations, ML learners are presented with words and context packed around numbers. ML problems are so bombarded with academic literacy to bring about meaning (context) to the mathematical content that it brings about a new barrier to learning.

This barrier can be described as a language gap between the learners’ English proficiency and the linguistic demands of learning the mathematical content and context through the medium of English which is not their home language. Both the FAL English teachers and learners require a greater communication between the literacy and the mathematics in ML. Therefore to be able to communicate mathematically requires integration of the English language skills and the mathematical language in ML by the teachers and learners alike. Therefore, the language practices as described by many researchers, are being investigated in this
study, in particular the LoLT English (Heugh, 2002; Setati, 2005a, 2008). This research is based on my own observation as a teacher in my bi/multilingual ML classroom. The focus of this research was to elicit the FAL English teachers’ and learners’ perceptions and experiences with the LoLT English in their bi/multilingual ML classrooms.

The assumption at the outset of this study was that FAL teachers and learners have challenges and problems when attempting to teach and learn ML in the LoLT English, which is not their home language, in bi/multilingual classrooms. These challenges and problems are due to the contextualized nature of the mathematical content that is compounded with academic literacy in the word problems. The literature and the semi-structured interviews conducted in this study confirm, that these challenges and problems in ML bi/multilingual classrooms are related to language use (Setati & Adler 2001; Setati, 2005a, 2008).

As such, the study was designed to elicit the FAL teachers’ and learners’ perceptions and experiences with the LoLT English and whether they used languages as a resource, or whether it was perceived as a barrier to the teaching and learning in their ML classroom. It also included an investigation into the classroom strategies that teachers use to bring about understanding and interpretation of the ML content and context with the LoLT English. An unexpected concern by the teacher participants was revealed.

3. MAIN FINDINGS

The findings of this study suggest that most of the objectives of the research were achieved, namely, the language practices by both the teachers and learners for teaching and learning in bi/multilingual ML classrooms were identified; the perceptions and experiences of both the teachers and the learners were described; and useful classroom strategies were shared within the limitations of their subject ML.

The data from the teacher and learner semi-structured interviews exposed the preferred use of both English and their home language isiZulu by revealing
language practices such as: revoicing, translation or code switching. Although most of the participants were not familiar with the term code switching, their responses described the use of this strategy in their ML classroom. The fact that code switching was revealed in the study as a teaching strategy to support learning, it therefore supports other research findings (Rose & van Dulm, 2006; Setati, 2002, 2005a) in South Africa and internationally (Cummins, 2000; Moschkovich; 1996, 1999) that describes code switching as a common strategy used in classrooms where the language of learning and teaching is not the home language.

The frequent use of this strategy suggests that the language realities of FAL English bi/multilingual classrooms require a strategy that recognizes the learner’s home language as well as the language of learning and teaching. Moreover, it was interesting to find out from the interviews with the teacher participants in this study that code switching was not a planned part of their lessons, in other words their lesson plans did not indicate when English only, isiZulu only or code switching was going to occur. One explanation for this that is supported by the data generated in this study could be that the teachers are not aware that code switching is an acceptable practice in the South African context and that the Language-in-Education Policy (DoE, 1997) of South Africa encourages schools to use more than one language as a language of learning and teaching.

The data generated in this study also revealed that FAL English teachers are taking responsibility for their teaching of ML in the LoLT English. This is evidenced by their responses that described various strategies, other than code switching, which were used in their classrooms. As such, other strategies that were mentioned by the teacher participants were revoicing and translation (Adler, 2001; Moschkovich, 1996, 1999). English was frequently used for instruction and the teacher uses this strategy to clarify mathematical concepts that were perceived to be complex during the ML lesson. The teachers described how they were involved in rephrasing and rewording different mathematical concepts to bring about conceptual understanding of the mathematical concepts. In addition, the use of informal spoken mathematical language in the home language of the learners and formal written mathematical language in the LoLT English, need to be considered and formalised by curriculum
planners to give clarity and avoid confusion (Barwell & Setati, 2005; Setati & Adler, 2001).

Another finding of this study was that all the interviewed teachers revealed that they practised group work techniques in order to promote and encourage learner participation, and allow learners to construct their own knowledge using code switching. The teacher participants did not further elaborate about the types of group work dynamics that were planned or the types of interactions that emerged when the learners engaged with group work; however, the data revealed that the teachers provided this opportunity for the learners to engage with the ML content and context with an Outcomes Based Approach (OBE) as trained and stipulated by prior departmental documents (DoE, 2005, 2008). In this way, the teachers described their role as a facilitator or mediator of the learning process and the learners could use their home language isiZulu to support their learning of the mathematical concepts with a knowledgeable other within their ZPD (Vygotsky, 1978).

This study revealed that isiZulu, together with the LoLT English, was the language for group work, group discussions and whole class discussions. English was used by the learners to translate and revoice activities to be solved. They used English sentences as a starter when presenting answers to the teacher and reading instructions given to them. As such, a logical conclusion is that the learners preferred to discuss subject matter through their home language isiZulu and then to code switch/revoice/translate their discussions, sometimes with difficulties, into English. Researchers report that in multilingual classrooms where English second language speakers are taught in English, code switching practices are likely to happen (Rose & van Dulm, 2006; Setati, 2005a).

Another finding of this study was that the learners expressed that their use of their home language isiZulu was instrumental in their understanding of the mathematical concepts and the context in ML classroom; however, they also elaborated about the usefulness of acquiring fluency in the LoLT English. They revealed that English was seen as a language of access to “social and economic power” (Setati, 2008, p. 103). In this study, the learner participants have echoed the opinions of their parents with
regards to the acceptance of English only at school, which is described by de Klerk’s (2002) notion that the parents are knowingly and actively promoting a shift from their mother tongue to English in their children. In her study, she highlights that while many parents love their mother tongue, the pressures of a modern society and global influences steer their minds to the advantages of being English-speaking (de Klerk, 2002). The study revealed that parents force them to learn in English but they themselves do not know the language. According to Webb (2010) it is the “parents that perceive the power of English and are determined that their children will learn how to speak the language” (p. 162). In South Africa, it is the parents that want their children to be taught in English, and usually the sooner the better (Probyn, 2004). This theme, the power of English, has revealed that the learners considered it necessary to enhance their English competence and is in keeping with what was drawn from the literature.

Although the study did not specifically investigate the ways in which teachers can improve their English language proficiency, many of the teacher participants revealed the need to either embark on professional development or expressed their concern about the lack of appropriate in-service programmes. Despite many of the teacher participants holding an adequate teacher’s diploma or degree, many of them indicated their desire to access post-graduate studies, specifically in ML, so that their knowledge of the mathematical content increases. These utterances came from the teacher participants who migrated to ML from another learning area.

The data generated from this study revealed that most of the teacher participants articulated the need to learn English language skills particularly in comprehension, grammar, reading and writing but most importantly they expressed the need to learn how to effectively teach these skills to the learners during their ML lessons and they asked for in-service courses to address this perceived lack. In my opinion, professional development has become a pre-requisite for every teacher since the implementation of the NCS and currently the CAPS (DoE, 2006; DBE, 2011). In order for teachers to familiarise themselves with a new model of education in SA, i.e. the NCS and the CAPS (DoE, 2006; DBE, 2011), professional development was key to achieving academic success in any learning area.
The majority of the teacher participants spoke of the very few in-service workshops that were attended, and of the poor organisation of these workshops by the DBE. However it should be noted that a few of the teacher participants shared feelings opposing the above findings and had revealed their involvement in several in-service training programmes and thus praised the DBE for their contribution. The majority of the teacher participants described their feelings of disappointment with the DBE especially since South African education was undergoing such an essential curriculum transformation. The study revealed the almost non-existence of support and assistance to the teacher participants by education specialists such as subject advisors. There was a request for the more active involvement of education stakeholders in their learning area ML. They shared feelings of despair as they felt left out and forgotten. The findings also suggest that the purpose and type of the in-service training should not only be mathematics content related but rather on how language can be integrated to improve conceptual understanding of the mathematical content and context. These findings expressed the serious concerns of the educators that warrant an investigation into the shortfall of in-service training by the DBE. It is research such as this which can be forwarded to the DBE as evidence that could highlight the teachers’ challenges and problems in the classroom situation which could motivate the DBE to put into place more organised and appropriate in-service training programmes for all teachers as per their request.

4. RECOMMENDATIONS

4.1. The most urgent reform – Changes in the language practices in the current LiEP (DoE, 1997)

The most apparent outcome of this study has revealed that changes in the language practices in the current LiEP (DoE, 1997) are one of the most urgent reforms needed to improve access, quality and outcomes in South African education. The obvious change would involve the more explicit expansion and legitimating of the language practice of code switching or the implementation of mother tongue instruction (MTI) and bilingual schools. According to Heugh (2002) such a change would require careful planning and implementation and involve materials development and in-service training, it would provide a “reasonable expectation of a
positive return on investment” (p. 193). Research (Heugh, 2002) has shown that this change is by no means unaffordable. Heugh (2002) describes explicitly in her research that the cost for the provision of materials would require only an increase of 1% of current expenditure on education which far outweighs the 5% expenditure on providing remediation for failures. In an earlier study by Heugh (2001) she describes that there is sufficient evidence which shows the linguistic, academic and social advantages of MTI and bilingual schools in order to “ensure that all pupils will have equal access not only to the school door but also useful and meaningful engagement with the curriculum” (p. 3).

What does a change in LiEP practices mean for SA? Literacy in MTI needs to be developed to the level that written texts and oral language in the teaching and learning of ML can be understood by the learner. This process should not be interfered with in any way by the policy makers and curriculum developers and planners such that all FAL English learners need to have a very good teaching of their home language and an introduction of the FAL English should occur as late as eight years into their primary school education (Foley, 2007). If a switch from MTI to another language of instruction such as English is done too early in the first two formative years of the learner, then the learner would not have developed a high level of proficiency in both the home language as well as the FAL English. The Thomas and Collier (2002) study on education in the USA included full mother tongue instruction programmes. Their results show that “the strongest predictor of L2 (second language) student achievement is the amount of formal L1 (first language or mother tongue) schooling. The more L1 grade-level schooling, the higher L2 achievement was obtained” (Thomas & Collier, 2002, p. 7). In this study the most unsuccessful results were with students in regular programmes where the students’ mother tongues were either not supported at all or where they only had some mother tongue instruction. Their learning was mainly done in English, a language that is not the mother tongue of the students. In such a case, the learning process is disrupted and therefore competency levels remain poor in all learning areas.

The data from the teacher and learner participants in this study suggested that their favourable choice to teach and learn is in their home language isiZulu alongside
English, indicating the interest with bilingual education. What is the way forward? The language of high economic, educational and political status in South Africa, i.e. English should be seen as a complimentary medium of learning in a learner’s secondary school education alongside the learner’s home language isiZulu, i.e. bilingual education. The mastering of complex, abstract or academic concepts, as found in the ML curriculum, in an inadequately known FAL English is always problematic as this study indicated. However, once mastered in the mother-tongue, both concepts and cognitive skills also transfer readily and are available for use in intellectually demanding contexts thereby adding to the necessary language proficiency (Heugh, 2001).

According to Cummins (1984) academic contexts are far more demanding than the more concrete, contextually supported circumstances in which everyday conversations take place, and the degree and type of skill required are very different. Cummins (1984) classifies communication skills according to intersecting sliding scales indicating cognitive demand and the amount of contextual support available. He distinguishes between basic interpersonal communications skills (BICS) in the first quadrant, which may often take as little as two years to acquire, and cognitive academic language proficiency (CALP) in the fourth. The CALP involves the ability to communicate effectively in context reduced, cognitively demanding, educational situations (Cummins, 1984). It is with this notion that many researchers describe that a complete switch from MTI to English only, is not necessarily the best way to ensure the developed proficiency in the FAL English (Foley, 2007; Heugh, 2001, 2002).

The fact that many teachers and learners have expressed positive comments about their use of home language isiZulu in their teaching and learning augurs well for the future such that they have not undervalued their home language isiZulu in their education. As mentioned before, the teachers revealed the extensive use of code switching as a classroom strategy. However, the concern is that code switching is not recognised by the teachers as a legitimate classroom strategy in FAL English classrooms. Adler (2001) described this as the dilemma of code switching. The recommendation is therefore to make FAL English teachers and learners alike, to be aware of the fact that code switching is a viable strategy to be used in classrooms,
as stipulated by the LiEP (DoE, 1997), so that teachers can develop code switching skills to use and integrate it carefully in their daily planning and preparation of lessons. Therefore, during the ML lesson, teachers can implement it carefully by factoring it into their lesson plans and seize the best opportunity to use it appropriately thereby maximising its benefits.

4.2. Access to ongoing in-service training

The interviews with teachers around the use of group work did not reveal the group work dynamics that were planned or the types of interactions that emerged when the learners engaged with group work. Strategies such as scaffolding and collaborative discussions were mentioned but these strategies were not elaborated. There was little input about the group work dynamics from the learners as well. The recommendation is to engage in further research using instruments such as classroom observations so that the researcher can provide further insights about the teachers’ classroom practice that incorporates strategies such as group work as effective or not. These insights could draw on their good practices especially with language practices to benefit all or guide teachers into improving their classroom practices to successful ones to use as an effective strategy.

In this study, the finding of group work and discussions thereof were an indication that such strategies were drawn on. However, the teacher participants were hesitant to divulge the details of their group work, scaffolding or collaborative discussions, thus indicating that they were most probably not engaging in group work at all or they possessed little understanding of what constitutes effective group work, scaffolding or collaborative discussions. Therefore, I recommend that the teachers should take the responsibility of accessing ongoing in-service training (INSET) on effective classroom strategies that can be used appropriately enabling teachers to be better planners and facilitators in ML bi/multilingual classrooms. As per the opinions of the teacher participants, specific in-service courses, such as effective classroom strategies in ML teaching that incorporate the development of English literacy skills and mathematical skills, should be the key aspect. Also, specific workshops should also focus on aspects such as remediation, acquiring fluency in
English as well being able to teach about acquiring fluency in English in bi/multilingual ML classrooms.

Since teachers showed such enthusiasm to embark on professional development and post-graduate studies in ML, the DBE should give this idea a considerable amount of thought. The DBE should at least be able to subsidise the teachers a percentage of the tuition fees so that the whole financial burden does not lie on the shoulders of the teacher. This financial commitment by the DBE would indicate to the teachers and all stakeholders involved that the DBE is willing to take steps to improve and promote quality education in SA, and that the DBE is able to identify with the challenges and problems of the FAL English teacher. From the opinions of the teacher participants, I also recommend further research into how effective the in-service training has been.

5. LIMITATIONS OF THE STUDY.

The findings of this study should be viewed within the following limitations. The data that were collected from the semi-structured interviews had to be translated via a translator/interpreter. Notwithstanding the fact that my translator/interpreter is very fluent in isiZulu and English, translation may not encompass all nuances and therefore meaningful data could have been lost during the translations from isiZulu to English and vice versa for reasons beyond his control, such as: general fatigue; loss in interest during the translations due to the same repeated responses that were received from participants or anxiousness to speed up the tedious interview process.

Doing research in an unfamiliar territory or with unfamiliar participants proved to be quite a challenging task because I did not receive the co-operation of the one ML teacher in school five, thus a mathematics teacher of the grades 8 and 9 substituted for this sample. The teacher was unwilling to sign the permission documents to grant me an interview. Despite the precise description of the nature and purpose of the research being undertaken, and the condition of anonymity that was part of the ethical considerations, the teacher still declined to participate. The reason was hinted via the school principal that the teacher was under the impression that I was
to evaluate them in an official capacity and report their weaknesses to the DBE. In this study the number of teacher participants remained constant. However, this change in the sample did not create a void in the data or the conclusions, since the purpose of my study was not to come up with generalisations but to learn about individual teachers and learners in their school environments.

Another limitation of this study was that one of the objectives was not completely achieved, i.e. to elicit and draw on the FAL teachers’ good classroom practices or strategies in bi/multilingual ML classrooms. Many teacher participants mentioned strategies such as group work, scaffolding and collaborative discussions that the learners were exposed to. However, when I probed further to elicit more details and gain a better insight into the types of group work dynamics that were planned, or the types of interactions that emerged from such strategies they were not forthcoming in their responses. The responses of the learners as well failed to provide meaningful data about group work tasks that they engaged with. Thus, the information about group work, scaffolding and collaborative discussions only revolved around the use of code switching, and using isiZulu to support their teaching and learning.

The findings from this study could have been further enhanced if the desired number of grade 12 ML teacher participants from each selected school could have been achievable (as described by the sample in chapter 3). This study was designed on the assumption that the number of the ML learners in rural secondary schools would be far greater than the number of mathematics learners, as is the situation in my own school. However, this was not the case, (see table 4 in chapter 3) the number of mathematics learners far outnumbered the ML learners, and therefore the number of grade 12 ML teachers were limited. Thus, I had to remedy the shortfall with grade 10 and 11 ML teachers from the selected schools.

6. CONCLUSION

To specifically highlight and emphasise: the research findings of this study support that of other studies (Adler, 2001; Heugh, 2001, 2002; Rose & van Dulm, 2006; Setati, 2005a) which emphasise the role of mother tongue in learning and that code switching is an invaluable strategy in bi/multilingual classrooms that should be made
explicit to FAL English teachers and learners alike. This should thus provide insights for the local DBE individuals who strive to empower ML FAL teachers with novel, essential and effective pedagogies; especially those who attempt to wholly assist FAL learners to use their real life-related knowledge and experiences to close the language gap between learning in the LoLT English and their home language isiZulu. These indications therefore brings about serious concerns that education stakeholders in South Africa need to consider such as: revisiting and reflecting upon the current LiEP (DoE, 1997) specifically to clarify the notion of additive bilingualism and the acceptance of the use of code switching in bi/multilingual South African classrooms; educating it’s South African citizens about the benefits of mother tongue instruction; and providing adequate and appropriate INSET programmes to FAL English teachers and the partial funding to access postgraduate studies. Postgraduate studies in ML would equip teachers with the necessary mathematics knowledge and skills required to be an effective ML teacher and that in itself is a battle half won as the FAL English teachers become more confident with their own competence in their bi/multilingual classrooms.

In this study, the perceptions and experiences of the FAL teachers and learners with the teaching and learning of ML in the LoLT English revealed their challenges and problems within their bi/multilingual classrooms. The findings of this study revealed that the participants’ home language isiZulu, was the preferred language to use and that code switching was a common practice during their teaching and learning of ML. Participants highlighted that English was used only because of its global power, and also, it was the LoLT as prescribed by the LiEP (DoE, 1997), and textbooks, assessments and examinations were in English. Thus, the role of mother tongue instruction cannot be ignored and that code switching needs to be wholly legitimised in South African bi/multilingual classrooms.
BIBLIOGRAPHY


APPENDICES

APPENDIX A

GLOSSARY OF TERMS

**Mother tongue:** Refers to the language that a learner has acquired in his/her early years and which has normally become his/her natural instrument of thought and communication.

**Home language:** Refers to the language that is spoken most frequently at home by a person. In this study the home language is isiZulu.

**Language of learning and teaching (LOLT):** Refers to the language medium in which learning and teaching, including assessment, takes place. In this study the LoLT is English.

**Bilingualism:** Refers to the ability to communicate effectively in two languages, with more or less the same degree of proficiency in both languages.

**Multilingualism:** Refers to the ability to speak more than two languages; or to be proficient in many languages.

**Code switching:** Refers to switching from one language of instruction to another language of instruction during teaching and learning.

**Dual medium of instruction:** Refers to the use of two media (languages) of instruction by a teacher in a lesson, switching from one medium (language) to the other, on a 50:50 ratio.

**Language learning areas:** Refers to any of the 11 official languages, other languages approved by the Pan South African Language Board (PANSALB), Braille and South African Sign Language, approved by Umalusi.
**Language level**: Refers to the level of proficiency at which language learning areas are offered at school (e.g. home language, first additional language, second additional language).

**Language proficiency**: Refers to the level of competence at which an individual is able to use a language for both basic communication tasks and academic purposes.

**African language**: In the context of this study, the term refers to South Africa’s nine official languages namely: isiNdebele, isiXhosa, isiZulu, Sepedi, Sesotho, Setswana, Siswati, Tshivenda and Xitsonga.

**Single/main medium of instruction**: Refers to the use of one medium (language) of instruction by a teacher in a class.

**Single/main medium school**: Refers to a school that uses one medium of instruction (language) for all learners in all grades.

**Preferred language of instruction**: Refers to the (preferred) language of instruction indicated by a learner at the time of registration.

**First additional language**: Refers to a compulsory language subject that learners have to study at that level. In this study the FAL is English.
APPENDIX B

SCHOOL PROFILE FORM

Dear Principal, along with your consent I require the above demographical data about your school which can be accessed from your school’s SAMS database.

NAME OF SCHOOL: ________________________________

SCHOOL QUINTILE RANK: _________

TOTAL NUMBER OF LEARNERS IN THE SCHOOL: _________

NUMBER OF TEACHERS IN THE FET PHASE – GRADES 10 – 12
(IN THE SUBJECT MATHEMATICAL LITERACY ONLY): _________

NUMBER OF TEACHERS IN THE FET PHASE – GRADE 12 ONLY
(IN THE SUBJECT MATHEMATICAL LITERACY ONLY): _________

GENDER OF THE ABOVE NUMBER OF TEACHERS - GRADES 10 – 12
MALE: _____
FEMALE: _____

NUMBER OF LEARNERS PER GRADE IN THE FET PHASE – GRADES 10 – 12
(MATHEMATICS AND MATHEMATICAL LITERACY):

GRADE 10 - MATHEMATICS: _______
    MATHEMATICAL LITERACY: _______

GRADE 11 - MATHEMATICS: _______
    MATHEMATICAL LITERACY: _______

GRADE 12 - MATHEMATICS: _______
    MATHEMATICAL LITERACY: _______
APPENDIX C

TEACHER PROFILE FORM

PERSONAL DETAILS
TITLE AND SURNAME: ..............................................................................
FIRST NAMES: .........................................................................................
DATE OF BIRTH: .......................................................................................
GENDER: ..................................................................................................
CELL NUMBER: .........................................................................................
HOME TEL: .................................................................................................
WORK TEL: .................................................................................................
HOME ADDRESS: ...........................................................................................
....................................................................................................................... 
POSTAL CODE ....................

SCHOOL DETAILS
NAME OF SCHOOL: ....................................................................................
SCHOOL PRINCIPAL: ..................................................................................
SCHOOL TEL: .................................FAX: .............................................
PHYSICAL ADDRESS: ...................................................................................
....................................................................................................................
POSTAL ADDRESS: ....................................................................................
....................................................................................................................
POSTAL CODE ....................

TEACHING DETAILS
NUMBER OF YEARS TEACHING ..............................................................
MAIN SUBJECT(S) YOU HAVE TAUGHT DURING THE LAST 3 YEARS:
....................................................................................................................

GRADES TAUGHT AND NUMBER OF YEARS TEACHING THEM:
GRADE 7 8 9 10 11 12 ....................
NO OF YEARS TEACHING THEM: ............
NO OF LEARNERS THIS YEAR: ............
NUMBER OF YEARS TEACHING MATHEMATICAL LITERACY: ..........
IF YOU ARE CURRENTLY TEACHING MATHEMATICAL LITERACY, WHICH GRADE(S) ARE YOU TEACHING? ...........................................................................................................
BESIDES MATHEMATICAL LITERACY, WHICH OTHER SUBJECTS ARE YOU TEACHING?

…………………………………………………………………………………………………………
……………………………………………………………………………………………………

TEACHER QUALIFICATIONS

QUALIFICATION(S): ……………………………………………………………………………
………………………………………………………………………………
YEAR(S) OBTAINED: ……………………………………………………………………………
INSTITUTION(S): ………………………………………………………………………………
MAJOR SUBJECTS: ………………………………………………………………………………
………………………………………………………………………………
HIGHEST LEVEL STUDYING MATHS
E.g.: Matric or College or Year? ……………………………………………………………
………………………………………………………………………………

OTHER REGISTRATIONS

ARE YOU CURRENTLY REGISTERED FOR FURTHER STUDIES?
……………………………………………………………………………………………………
IF YES, WHICH INSTITUTION? ……………………………………………………………..
WHAT PROGRAMME ARE YOU STUDYING FOR? ……………………………………..
……………………………………………………………………………………………………

THANKING YOU
Saloshni Pillai
RESEARCHER
HOME: (036) 352 4003
CELL: 084 589 9869
email: salo.pillai@gmail.com
APPENDIX D

TEACHER INTERVIEWS – ENGLISH VERSION
Questions to be used during the Interview Process

1. Which language(s) do you use to support your teaching of the inter-related nature of mathematical literacy content and context in your classroom?
   • Why do you choose to use this language(s)?

2. Which language(s) do you prefer to use when clarifying specific concepts, (that is to bring about conceptual understanding) that are so content driven by the mathematical literacy curriculum?
   • Why do you choose to use this language(s) at this point in your lesson?

3. How do you feel using English as a medium of instruction and assessment in your mathematical literacy classroom?
   • If a negative response is given- probe further to ascertain specific reasons.
   • If a positive response is given- probe further questioning the acceptance and advantages of English as a LoLT.

4. Which language(s) do learners use as a channel of communication with your or classmates in order to understand the contextual word problems?
   • Why do you think they resort to using this language(s)?

5. Do you provide learners with opportunities (lesson strategies) to talk (exchange ideas), discuss, argue and engage in conversation when you teach?
   • How do you do this during your lesson?

6. Which language do you mostly use to teach the word problems and word problem-posing that is richly filled with academic literacy?
   • Why do you choose this language(s)?
INTHAYVU KATHISHA – ISIZULU VERSION

1. Yiluphi ulimi noma izilimi ozisebenzisayo ukusekela ukufundiswa kwe Mathematical Literacy egunjini lakho lokufundisa?
   - Yini eyenze wakhetha lolu limi noma lezi zilimi?

2. Uncamela luphi lona ulimu noma izilimi uma ucacisa noma uchaza kabanzi ngezinto eziphathelene neMathematical Literacy?
   - Yini eyenza ukuthi usebenzise lolu limi kulesi sigaba sesifundo sakho?

3. Uzizwa kanjani usebenzisa ulimu lwesi gisi egunjini lokufundela uma ufundisa i-Mathematical literacy?
   - Uma impendulo yakho ingeyinhle sekela ngezizathu ezenza kubenjalo.
   - Uma impendulo yakho iyinhle sekela ngezizathu ezitshengisa ukuthi isigisi silungile ukuthi kufundiswe ngaso egunjini lokufundela.

4. Yiluphi ulimi noma izilimi ezisetshenziswa ngabafundi ukuze baxhumane nozakwabo noma wena uqobo lwakho ukuze baqonde izinkinga zemibhalo bezixazulule?
   - Ucabanga ukuthi kungani bephephela kulolu limu?

5. Uyabanikezela yini ithuba abafundi ukuthi bakhulumela,baxoisane,baphinde baphikisane lapho ufundisa?
   - Ukwenza kanjani lokhu uma ufundisa?

6. Yiluphi ulimi olusebenzisa kakhulu ukufundisa ezokuxazulula izinkinga ezicebe kakhulu nge-academic literacy?
   - Yini ekwenza ukhethe lolu limu?
1. Which language do you use to communicate with your classmates in your mathematical literacy classroom?
   • Why do you use this language(s)?

2. Which language do you use to communicate with your teacher in your mathematical literacy classroom?
   • Why do you use this language(s)?

3. Which language do you use to communicate with your friends during your breaks or in the playground?
   • Why do you use this language(s)?

4. Which language do you prefer to use when you solve word-problems in your mathematical literacy tasks, activities or assessments?
   • Why do you use this language(s)?

5. During a Mathematical Literacy lesson, do you feel that you are competent (capable, experienced and skilled) to cope /engage with the mathematical context and thereafter apply the mathematical content that is required to be successful in problem-solving?
   • Can you expand by providing reasons why you feel this way?

6. What problems/difficulties do you usually have when understanding and calculating word-problems in the mathematical literacy classroom?
   • What language do you use when you communicate these problems to your teacher or classmates?

7. Does your teacher or you use code switching, (it a term/strategy explaining the use of English and isiZulu in single utterances in the classroom to bring
about understanding during a lesson)?

- Do you have a better understanding of the mathematical context, concepts and content in the word problems in this way?
- How do you feel about the use of code switching that your teacher engages with in the classroom?
- Could you expand on your response by providing reasons?

8. Which language do you prefer to be taught mathematical literacy with?

- Why do you feel this way?

9. How do you feel being taught in English? Please elaborate.

- Would you prefer being taught in your mother tongue i.e. isiZulu?
- How would this impact/effect you in all the class assessments and examinations that is written in English?
- What suggestions can you provide to overcome the language problems that are encountered by you in your classroom?
- Do you feel that you will be losing your culture if your teacher uses English only?

**INTHAVYU YOMFUNDI – ISIZULU VERSION**

1. Yiluphi lona ulimu olusebenzisa yo uma uxhumana nozakwenu egunjini lokufundela ngesikhathi seMathematical Literacy?

- Kungani ukhethe ukusebenzisa lolu limi?

2. Yiluphi ulimu olusebenzisayo ukuxhumana nomfundisi wakho egunjini lokufundela?

- Kungani ukhethe ukusebenzisa lolu limu?

3. Yiluphi ulimu olusebenzisayo ukuxhumana nabangani bakho ngesikhathi sekhefu noma enkundleni yokudlala? (uma ungekho esimweni sasekilasini)

- Kungani ukhethe ukusebenzisa lolu limu?
4. Yiluphi ulimu okhetha ukulisebenzisa uma uxazulula izinkinga zemibhalo emisebenzini yakho yeMathematical Literacy?
   - Kungani ukhethe ukusebenzisa lolu limu?

5. Ngesikhathi ufunda iMathematical Literacy ucabanga ukuthi unalo yini ikhono nobuchule bokumelana nezinto eziqukethwe nezenziwayo kwaMathematics bese ukwazi ukuzisebenzisa ekuxazululeni izinkinga?
   - Naba unike nezizathu ezenza uzizwe kanje?

6. Yiziphi izinkinga noma izingqinamba ovame ukuhlangabezana nazo uma uzama ukuqonda noma ukuxazulula izinkinga zemibhalo?
   - Yiluphi ulimu olusebenzisayo futhi kungani ukhethe ukusebenzisa lolu limu uma uxoxtela uthisha noma ozakwenu ngalezi zinkinga obhekene nazo?

7. Uma uthisha wakho eshintsha izilimi ukuze nikwazi ukuqonda kungcono uzizwa kanjani ngalolu shintsho, ubona ukuthi uyiqonda kungcono yini iMathematical Literacy?
   - Uzizwa kanjani ngalolu shintsho uthisha alwenzayo egunjini lokufundela?
     Naba uchaze kabanzi ngempendulo yakho ngokunikeza izizathu.

8. Yiluphi ulimu oncamela ukufundiswa ngalo iMathematical Literacy?
   - Kungani uzizwe kanjena?

   - Uncamela ukufundiswa ngolimi luka mama okuyisiZulu?
   - Ingakube loku kunanamthelela/iqhaza lini kuko konke ukuvivinywa kanye nokuhlolewa okukhulu okushalwe ngesi Ngisi?
   - Yiziphi izincomo ongoqhamuka nazo ukunqanda izinkinga zolimi lezi obhekene nazo ekilasini?
   - Unqazizwa unomuzwa wokulahlelekelwa yisiko lakho uma uthisha esebenzisa isiNgisi kuphela?