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DECLARATION

I declare that the work presented in this research report is my own. I have acknowledged all sources that have been of assistance. This report is being submitted in partial fulfillment of the requirements for the degree of Master of Science Education at the University of the Witwatersrand and has not been submitted for any other degree or examination at any other university.

Dumisani Simon Maphanga

01 September 2011

ABSTRACT

The abolishment of apartheid in the early 1990s has led to a consistent influx of black learners from township schools into Ex-Model C schools (former white schools) in search of better education (Gee, 1995; Doe, 1996). Most of the learners have little or insufficient command of the English language (Adler, 2001). This is because in their previous schools they were taught mainly in their mother tongues or African languages and partly in English (SASA, 1996).

Consequently, the language-in-education policy advocated the use of African languages so that these once marginalized languages could assist learners to access academic knowledge, including Mathematics (Doe, 1996). In theory, the implementation of the language-in-education policy leads to the equitable promotion of all of South Africa's eleven official languages. According to SASA, it is the learners' constitutional right to be taught in their preferred language (SASA, 1996).

The research aims of this study were structured around language challenges, diversities and dynamics that prevail in Ex-Model C Schools for the ESL learners. For instance, some learners might not even speak English at their homes, but have to learn and apply mathematical English concepts. In this report I present evidence gathered from the parents, learners, classroom observations and educators pertaining to these issues. Three Ex-Model C Schools were selected. Parents of all three schools completed a questionnaire as did learners in 3 Mathematics classes at these schools. Three learners from each participating school were interviewed. Three educators from these schools were also interviewed. Classroom observations were undertaken and videotaped and transcripts were made for analysis.

One of the major findings that was made in this research concerned the teaching methods that educators could use for ESL learners who had a weak command of English. These included systematic repetition and persistent probing through the use of proper English coupled with the insertion of vernacular phrases to elucidate the intended meaning.

DEDICATION

This work is dedicated to the following people who inspired me and even supported me during my years of study: my wife Ntombikhona and my two sons Ndumiso and Malibongwe; my sister Londiwe, my niece Noxolo and nephew Xolani; my former principal Dr VK Joseph and staff of Mandisa Shiceka High School; my former district and staff of Gauteng West District, the director Elize Froneman, CES CDS unit head Peter Skosana and the GDE GET Mathematics facilitators, the GDE GET curriculum unit staff at Provincial Head Office of the Gauteng Province; my present director for GDE GET Phumelele Tloubatla and my manager Gopalan Derek Moodley; and the Church of End-Time Gospel in Tshepisoong West (Mnandini) and Braamfischerville. Above all, I would like to forward my deepest gratitude to my Lord and Savior Jesus Christ.

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DEFINITION OF KEY TERMS

1. Apartheid: in the context of this setting this refers to the erstwhile segregation and discrimination of certain population groups of South Africa.
2. Artifacts: The use of a related example, situation, etc. to explain another situation. Through demonstration, mentoring or showing, a better understanding is achieved (Oxford dictionary)
3. Black: refers to people of African origin.
4. Code mixing: According to Li (1998; 2000), code-mixing refers to any admixture of linguistic elements of two or more languages.
5. Code-switching: is defined by Adler (2001) as the use of more than one language in the same conversation.
6. Discourses: ways of being in the world, through interaction and engagements (Moschkovich, (1999).
7. Dynamics: in the context of this study this refers to the diverse usage of languages in the same setting, which might cause inconveniences.
8. English: the English language.
9. Ex-Model C schools/Former Model C schools: these two terms are used synonymously in this study refer to previously white only schools (SASA, 1996).
10. Formal mathematical language: Adler and Setati (2000) further explain that formal mathematical language refers to the standard use of terminology (mathematical register).
11. Informal mathematical language: Adler and Setati (2000) state that informal language can be referred to as the kind that learners in their everyday lives use to express their mathematical thinking.
12. IsiZulu or Zulu: the Zulu language, as spoken by the Zulu people.
13. Language practices: refers to the manner in which language is used for learning and teaching purposes (Moschkovich, 1999)
14. Linguistic Capital: The linguistic capital refers to the linguistic status of English (Barwell, 2003; Zevenbergen, 2000) or the language of power (Setati, 2002).
15. Mathematics: same as mathematics, meaning the body of knowledge of the subject, SASA (1996)
16. Mathematics talk/informal mathematical language: involves the mathematical discussions that learners engage in, regardless of the proper mathematical syntax or language.

17. Mother tongue/vernacular/African languages: though these terms do not mean the same thing, in this study, however, they refer to any African language.
18. Multilingual: the presence of more than one language in a particular setting (Barwell, 2003).
19. Re-voicing: Re-voicing is the art of identifying what the learner means against what the learner wants to say (Moschkovich, 1996).
20. Setswana: the Setswana or seTswana language, as spoken by the Tswana people.
21. Social goods: Gee (2001) explained that these include employment, status, success in mathematics, etc. that becomes available through the use of the English language.
22. Vernacular: mother tongue, African language.
23. White: in the context of this study this refers to the European race as classified during the apartheid era.

ACRONYMS

1. DOE: Department of Education
2. ESL: English Second Language
3. FET : Further Education and Training
4. GET : General Education and Training
5. LIEP (LISP): Language In Education Policy
6. LISP (LIEP): Language In School Policy
7. LOLT: Language of Learning and Teaching
8. SASA: South African Schools Act
9. SGB: School Governing Body

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Chapter One

INTRODUCTION

1.1 INTRODUCTION

This chapter introduces the study. It also explains the chapter aims, context and the rationale. The introduction captures the essence of the research, that is, the research aims and the questions.

1.2 THE RESEARCH PROBLEM

The language and cultural diversity that exists in multilingual classrooms in South Africa has the potential of seeing the successful implementation of the language-in-school policy. The recognition of the eleven official languages was an attempt by the government to provide equal access to information and knowledge for all learners in South African schools (SASA, 1996). It is important to know how the policy was implemented and whether the implementation in multilingual settings facilitated access to mathematical knowledge. The possibility of certain learners being disadvantaged because of prevailing language dynamics could not be denied. This observation is more applicable to schools in which English is the main language of instruction and where the Mathematics educators cannot speak the learners' main languages, that is, any of the South African native languages. This research sought to investigate these language dynamics more closely in Ex-Model C High schools of Gauteng West District, Johannesburg, South Africa.

1.3 AIMS AND PURPOSES OF THE RESEARCH

The aim of this research was to investigate how Ex-Model C Schools made use of language resources to teach Mathematics. The assumption that the educators and learners in these schools are multilingual will be verified. One of my aims was to investigate whether learners from township schools were able to use their own languages or not (African languages in this case) to learn Mathematics. I aimed to uncover the diverse challenges associated with the presence of more than one language in the Mathematics classroom. Hence, the summary of my aims was to investigate:

- how learners and teachers in Ex-Model C Schools dealt with issues of language diversity in Mathematics classrooms;
- how the diversity was used (or not used) as a resource by teachers to assist learners access mathematical knowledge;
- how the language-in-school policy could have been better implemented for the benefit of all Mathematics learners and
- whether or not the language practices were in line with the language-in-school policy.

The focus of the study was on Grade 9 in Ex-Model C Schools in Gauteng West district, Johannesburg, in the Gauteng Province of South Africa.

1.4 RESEARCH QUESTIONS

1.4.1 WHICH LANGUAGES ARE USED IN GRADE 9 MATHEMATICS CLASSROOMS IN EX-MODEL C SCHOOLS?

This question assumed the presence of diverse languages and that these were indeed spoken in the Ex-Model C School. However, the key word was “**which**”. This calls for supportive questions such as: Why such languages were used? Which were the dominant or less dominant ones? Which was the main language of learning and teaching? The teacher’s language, and the language of learning and teaching was also considered because the manner in which these might have been used could have promoted or hindered the usage of other languages within the classroom. Another reason for focusing on this aspect was because the influence of the language spoken by the teacher had a significant effect, especially if it was not the main language of learning, particularly in an Ex-Model C School.

1.4.2 HOW ARE THE LANGUAGES USED IN THE LEARNING AND TEACHING OF MATHEMATICS?

Though certain languages have been favored over others in the learning and teaching of Mathematics, this question sought to investigate how such languages, as well as other marginalized ones, were indeed used for learning and teaching of Mathematics. This was critical because in the answer to the question about the languages used in Grade 9 Mathematics classrooms above, I would have established the languages that were practiced and the possible reasons for their usage. Following on the findings to this question I would also be in a better position to investigate further the challenges that prevailed in the learning and teaching of Mathematics as a result of diverse languages in the Ex-Model C classes. There

was a possibility that only one language was used and this was probably viewed as the best practice to ensure that all the learners understand each other. This is because it is practically impossible to speak all the eleven languages in the classroom and the educator might not know all of them. The other side of this argument was the fact that using only one language would have promoted that particular language at the expense of the other ten.

1.5 THE CONTEXT

The study was conducted mainly in School 1, an Ex-Model C school in Gauteng West District in one Grade 9 class of 30 learners. School 1 is in Krugersdorp, a town near Kagiso, one of the nearby townships. The other 2 High Schools were School 2 and School 3 also located around Krugersdorp. The criteria for this sample will be explained later in this report. Ex-Model C schools are schools which were once attended by white people only and therefore had better learning resources and media facilities (South African Schools Act, 1996) due to the segregationist principles of the apartheid regime. As a result of the reforms that came with South Africa's first democratically elected government (Doe, 1996) these schools started enrolling black learners who appeared to be in search of better education and the social goods these schools might provide (Setati, 2002).

Ex-Model C Schools were mostly located in city centres and suburban areas where, in the past, only the white population of South Africa resided. Up to date, the composition of educators in these schools is such that they are mostly white while the learners are predominantly black. It thus made an interesting case to investigate the language dynamics prevailing in such classrooms due to the presence of different languages from different cultural and tribal backgrounds of African black learners. Also interesting was to find out how learners who have mainly used African languages to learn Mathematics coped with the language demands of learning in a second language, which was mostly English.

1.6 THE RATIONALE

1.6.1 WHY THE STUDY IS IMPORTANT TO ME AS AN EDUCATOR IN THE FIELD.

My teaching experience is that in Ex-Model C Schools English and Afrikaans are widely spoken and the educators are mostly first language English or Afrikaans speakers. As an Ex-Model C School educator myself I have used English only, as a medium of instruction. This was due to the fact that speaking in a certain African language would have disadvantaged some learners of other languages and races. There

are presently many educators facing the same challenges and little research has been undertaken to shed light on such challenges.

I have also taught in many multilingual and multicultural schools and have encountered difficulties in assisting learners with a poor command of the English language. Hence, through this research, I am interested in assisting other educators who are faced with similar settings as I have encountered.

My present work responsibility as a district facilitator is to monitor policy implementation in schools. In trying to give advice and strategies to educators, it was important for me to do so based on informed research findings. This study informed me about the difficulties teachers face in the implementation of the language-in-school policy (Doe, 1996). I have also provided recommendations and suggestions for new and old educators in the Ex-Model C Schools. These contributions are important because of the continued changes within the education system and the demands it places on both learners and educators.

1.6.2 WHY THE STUDY IS IMPORTANT WITHIN THE FIELD OF MATHEMATICS EDUCATION

I have become one of the researchers at Wits Marang Centre for Mathematics and Science Education. My study is a further contribution to the body of knowledge that other researchers have developed on learning and language in the classroom. Through this study I aim to critique views and findings which have been reported about language usage in multilingual settings by other researchers such as Setati and Adler (2001), Moschkovich (1999), Barwell (2003), Pirie (1998) and Zevenbergen (2000). Furthermore, not much research has been done in Ex-Model C Schools of South Africa. These schools have been neglected in research especially in the area of language usage in Mathematics.

I have taught mathematics in many different schools each with many diverse languages and cultures. In my casual observations, I have noticed that in order to perform well in mathematics, learners must understand the relevant mathematics concepts and procedures. I have observed that such grasping is usually linked to English proficiency. I have observed that while most African black learners enter Ex-Model C Schools with less fluency in the English language, most of these schools do not provide extra help in the development of English language skills to assist these learners and as a result learners find themselves having to grapple, on their own, with both the English language as well as the mathematics

that is taught in the English language. I believe that this disadvantages the second language learners of English (ESL) in accessing mathematical concepts.

1.6.3 WHY THE STUDY IS IMPORTANT NOW IN SOUTH AFRICA

The present language-in-education policy (LiEP) was enacted to address the dominance of some languages in South Africa (Doe, 1996). There was a concern that some learners were disadvantaged in their learning of mathematics through the continuous use of a second language (Adler, 2001) which happened to be English or Afrikaans and hence the notion that certain language practices ignored and disregarded the context of a multilingual community especially in a rainbow nation like South Africa, according to the UNESCO (1994) report.

The language-in-school policy (LiSP) advocated the use of African languages so that these once marginalized languages (Doe, 1996) can assist learners to access knowledge of various kinds, including Mathematics. According to SASA, it is the learners' constitutional right to be taught in their preferred languages (SASA, 1996). The preferred language does not exclude African languages. The implementation of the language-in-school policy (LiSP) allowed for the equitable promotion of all official languages. This was very important as it had the potential to assist most South African learners access mathematical concepts and procedures needed to succeed in Mathematics. This study will augment information on the language-in-school policy (LiSP) implementation in South Africa.

However, it has been speculated that parents would rather prefer their children to learn in the English language, as doing so will benefit them in future studies (Setati, 2001). This is done in spite of the opportunity presented to learn in an African language. This research aimed at investigating this situation through the questionnaires that was filled in by parents in this regard.

1.7 ORGANISATION OF THE RESEARCH REPORT

This report is structured in the following manner:

Chapter One: Introduction

This chapter introduces the study. It also explains the research aims, the context and rationale. The research aims and questions are presented.

Chapter Two: Literature Review

This chapter explores relevant literature regarding language usage in multilingual mathematics classrooms. Similar studies by Adler and Setati (2001) which have been conducted in Ex-Model C classrooms show that English is the language of power used to purchase social goods.

Chapter Three: Theoretical Framework

This chapter provides the perspective from which the study will be viewed, that is, through the lenses of a community, domain and practice, as described by Lave and Wenger (1991), and incorporates the language practices that prevail in multilingual mathematics classrooms. While the learning models provided by Moschkovich (1996) shed more light on how best to deal with language challenges in these classrooms, the discontinuity model is used in this chapter to show that this model is necessary in identifying challenges brought about by languages. On the other hand, the situated model incorporates these challenges as resources to learn mathematics.

Chapter Four: Research Design

This chapter explains the methodology of my study. This includes the preparations for conducting the research, the criteria for the sample of schools, grade and respondents. All the data collecting instruments and how they were used are explained. Finally I discussed how ethical values were observed throughout the data collecting process, as well as the tools used to collect such data.

Chapter Five: Analysis

This chapter explains the analytical framework that guided the interpretation of the data gathered. It then presents the analyzed data and the summary of the findings that are used in the discussion chapter. I show how during the process of analysis, the elements of validity and reliability in interpreting data were observed. Inferences from all data instruments were triangulated in order to corroboration purposes.

Chapter Six: Discussion

This chapter provides detailed findings and justifications for the findings. The inferences and conclusions drawn are based on what the data shows. Also discussed in this chapter is how aspects of validity and reliability were adhered to.

Chapter Seven: Summary of Findings, Conclusion and Recommendations

In this chapter I highlight major findings and suggestions for further research.

1.8 CONCLUDING REMARKS

In this chapter I have explained the context within which the research has been undertaken including the research aims and questions. The rationale for the study was discussed. I alluded to the various challenges that educators are presently facing with regard to multi-lingual classrooms (UNESCO report, 1994). Moreover the importance of this study in the body of research cannot be overemphasized given that not much research of this nature has been undertaken in an Ex-Model C context. The state of our country in terms of educational changes demands that continuous examination of such education trends as learners' migration to Ex-Model C schools, be undertaken. Hence the research problem emanated from a need to investigate if Ex-Model C schools have developed teaching strategies that address language barriers.

Chapter Two

LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter I will discuss the literature that has assisted me to conceptualize and carry out my research study. I have used Lave and Wenger's notion of a socio-cultural perspective (Lave and Wenger, 1991) together with the situated model of Moschkovich (1996). I will also discuss how the language could become an instrument for discrimination especially against second language learners (Zevenbergen, 2000; Barwell, 2003) as well as general language issues in a teaching/ learning environment as they are explained by the UNESCO (1994) report. Hence the work of Setati (2002) will be useful in understanding the power struggle that exists among languages, in which English emerges as a winner due to the social goods it provides. The actual classroom of Ex-Model C Schools will provide more evidence to the challenges of using vernacular languages, which includes among others, the shortage of registers, as Adler (2001) proposed. Such challenges subsequently bound up with language discourses (Moschkovich, 1996) such as code-switching, re-voicing, etc., as a means to access mathematical understanding. I will finally conclude by looking at how policy with its applauded intentions could not assist in dealing with these challenges (Tollefson, 1995).

2.2 THE USE OF LANGUAGE AS A FORM OF DISCRIMINATION

Language may be used as a form of discrimination (Barwell, 2003). Barwell regards the 'forced' use of a dominant or minority language by other groups as discrimination. He explains that different languages employ various methods of communicating about the world since language forms an integral part of social practice, of which learning is a major part. In the UNESCO (1994) report, King (2002) and other authors asserted that language usage in the classroom carries with it issues of identity, nationhood and power. According to this claim, language carries with it many social perspectives of the world. Consequently, learners with different languages in the Ex-Model C Schools will learn and perceive Mathematics differently depending on their social perspective. Following this notion, the privileging of some languages over others could be interpreted as a form of discrimination in multilingual classrooms.

According to the UNESCO (1994) report, official languages of instruction are often those of colonizers, and their choice is linked to power and prestige. The dominant usage of English and Afrikaans languages in South Africa is as a result of the apartheid regime (SASA, 1995) which undermined the

native languages of South Africa. The Ex-Model C Schools presented a case where the official language was not the mother tongue, implying that it was the second language learners of English (ESL) who were thus placed at a disadvantage. Moreover, UNESCO (1994) report added that it is preferred that the mother tongue be taught as a language subject and also used for the acquisition of knowledge. This could help ESL learners in Ex-Model C Schools to comprehend and solve complex mathematical concepts presented in the English language (Setati, 2002).

Alexander (1999) and Bamgose (1999) further stated that learning in a language that is not one's own led to two challenges: one, which is the acquisition of the official language, and second, the ability to understand the knowledge rendered in the official language. Learning other languages opens one to other value systems of interpreting the world. Although mother tongue instruction has its benefits for competencies in other subject areas, there lies greater challenges such as lack of registers for school discourse (Adler, 2001), lack of recognition, lack of educational materials or resources to teach with, resistance of mother tongue in schools by parents, teachers and learners, and providing instruction in more than one mother tongue in cases where there are many mother tongues (Bamgose, 1999).

2.3 ENGLISH AS THE LANGUAGE OF POWER

The English language is favored over other languages because it is seen by both parents and learners as the language of power (Setati, 2005a). This is the language of learning and teaching in most high schools in South Africa. Most learners were reported to be multilingual and English was probably their third or fourth language and yet English was used as the medium of instruction. Barwell (2003: 37) explained this phenomenon by concluding that "who gets to use which languages in schools, as in wider society, is bound up with issues of access, power and dominance." Setati (2002) revealed that parents and learners preferred to learn Mathematics in the English language as this would help them understand it better and, therefore, afford them access to social goods (Gee, 2001). This dominance of English as a medium of instruction is expected to be prevalent in Ex-Model C Schools.

Zevenbergen (2001) explained that learners who have been disadvantaged through certain classroom interactions were often overlooked in normal classroom functioning. Students whose language matches or approximates middle class register may be positioned as more authoritative voices within the

classroom and hence perceived as having more power than fellow classmates from a working class. The school, and consequently the classroom, comprised certain pre-existing *habitus* (Zevenbergen, 2001). The *habitus* according to Zevenbergen, referred to the environment suited for a particular behavior. For example, the Ex-Model C classrooms might provide an environment that favors middle class learners and not learners from the working class. Hence this *habitus* might be or might not be that of the learners. Subsequently, the interpretation of simple statements uttered by the teacher might carry different meanings based on the different viewpoints of learners' previous (home and school) experiences of language perspectives.

Zevenbergen (2000) revealed that linguistic exchanges are not simple exchanges of languages but represent relationships of power among learners as well as the teacher, that is, language is a cultural product. Zevenbergen (2000) further explained that the linguistic *habitus* of the learners would affect the manner in which they function in the classroom and more importantly, their ability to access mathematical knowledge. For example, in my experiences in the Ex-Model C Schools, in order for learners to participate in classroom discussions they must have possessed the relevant knowledge for that particular context and this implicit requirement was not always clearly stated. Zevenbergen (2000) implied that middle class learners might appear to be at an advantage as classroom interactions bore similarities with the linguistic practices of their homes, for example, the use of English to teach Mathematics. These interactions, as alluded to by Zevenbergen (2000), may be influential in hindering or supporting the acquisition of mathematical knowledge. Finally, Zevenbergen's explanation of a *habitus* implied that the learners from the working class whose *habitus* is different from that of the classroom might be required to undergo certain changes in order for them to access Mathematics. The other observation is that the (ESL) learners who travel from a working class society in townships to the Ex-Model C Schools in towns to learn with learners from middle class society are at a learning disadvantage if, according to Zevenbergen (2000), their educators do not effect necessary changes to accommodate them.

2.4 COMPARATIVE STUDIES

2.4.1 THE SOUTH AFRICAN CONTEXT

The insights on language practices in multilingual classrooms provided by Adler (2001) assisted in understanding the language discourses prevalent in most South African classrooms. Some of these included the use of code-switching as a practice and the benefits of using this practice in multilingual classrooms. Adler (2001) revealed astounding issues in her research undertaken in Mohlakeng: a black township in Gauteng West District. The educator observed would not code-switch for various reasons. Adler's study revealed the dilemmas that educators are faced with in such settings. In her study, the educator was torn between code-switching for learners' easy access to mathematical concepts and the belief that code switching would be a disservice to the learners by denying them exposure to, and a possible acquisition of fluency in the English language (Setati, 2005a).

Adler (2001) also grappled with the idea whether code-switching was indeed a solution given the absence of vernacular registers for Mathematics. While code-switching posed a dilemma for some, other authors, (Barton, Fairwell & Trinick, 1998), felt that in order to grasp mathematical concepts, (ESL) learners need to translate the English instructions into their mother tongue. At the same time, even first language English speaking learners have had to translate mathematical concepts from the formal mathematical registers into their daily informal use of the English language (Adler, 2001). Faced with such a language challenge, Pirie (1998) claimed that the absence of English did not imply the absence of Mathematics, and this subsequently alluded to the situated model by Moschkovich (1996).

During the interviews that Setati (2003) undertook in one of the schools in Soweto with the learners of grade 11, it became clear that learners wanted to be competent in English in order to purchase the social goods which English could provide. These included going to university, getting a better job and being respected in society. This meant that learners had other intentions for speaking English other than just learning Mathematics. In a similar manner, Ex-Model C learners, as Lave and Wenger (1991) echoed, might have similar aspirations as the learners from Soweto in hoping that by being proficient in English they will achieve their life goals and ambitions.

Bamgose (1999) revealed astounding facts about the use of languages and the implementation of LiEP in South Africa. One of the observations was that most indigenous languages were not developed and therefore could not be used in a wider range of domains. This is a very big dilemma associated with learning in the mother tongue in South Africa. Subsequent to this was that though the policy meant to emancipate all languages from discrimination, the LiEP was perceived as denying blacks access to English and to power (Setati, 2001). The other observations were that implementing the LiEP while South Africa's poor education system was still undergoing transformations would be futile, probably because language is a vehicle of education. At the same time, the majority of blacks who felt that their languages were discriminated against were uneasy in sending their learners to schools in which an African language was used as a LoLT. It is for this reason that I have undertaken this research to highlight these contradictions with an aim of assisting the learners who are already at the Ex-Model C Schools.

2.4.2 OTHER STUDIES FROM ABROAD

Adding to this debate is the research conducted by Moschkovich (2002), in which learners' vernacular languages were used as resources to learn Mathematics. Moschkovich (2002) did most of her research in California, United States, where Latino students coming from Mexico experienced challenges due to their weak command of the English language. The discontinuity model according to Moschkovich (1999) drew more focus to the hindering factors of accessing Mathematics, and in this case the English language. Furthermore, she explained a situated model that sought to incorporate language resources as a means to facilitate learning. The learning of Mathematics is viewed as situated within the language dilemmas. In this model, she further explained that learning becomes situated within the learners' activities, which include their languages, cultures, social backgrounds and so on. In the situated model, language was thus not seen as a barrier (the discontinuity model) to learning and teaching but as something that should be incorporated (situated model) with an aim of enhancing learning and teaching.

The UNESCO (1994) report highlighted the intensity of language diversities in other nations. While China has the most people speaking Mandarin, about 900 million, however this does not mean that Mandarin is the majority language in the face of other national majority languages. By comparison, the most spoken native language in South Africa is Zulu, but it loses its majority to English given that a considerable portion of the Zulu population can also speak English. This diversity extends to classroom settings in which one might find the majority African language being, for example, Setswana, but

learning and teaching being done in the national majority language. This happens to be English even though it is spoken as a first language by a minority people in South Africa.

Adler (2001) undertook a research assignment in Catalonia, where most learners were foreigners and hardly spoke the Catalan language. What was strikingly astounding was the fact that they were taken right into mainstream education with other learners who knew Catalan without attending to their language deficits. Consequently, the school authorities had to re-strategise and have the learners attend Catalan classes in order to improve their knowledge of the Catalan language. A parallel can be drawn with the Ex-Model C Schools in South Africa in which it can be suggested that ESL learners attend special classes in which they are taught English to an acceptable standard that will facilitate the acquisition of mathematical knowledge. However, by leaving them with mainstream learners who are already fluent in English, the dilemmas of communication and access to knowledge cannot be avoided as the learners might end up frustrated.

2.5 THE IMPLEMENTATION OF THE LANGUAGE IN EDUCATION POLICY

The *National Education Policy Act* (Act 27 of 1996) which gave rise to the *Language-in-Education Policy* (1997) spelled out the following intentions:

1. Recognition of cultural diversity to promote multilingualism in South Africa.
2. The right to choose the language of learning and teaching by all citizens.

With regard to these statements from the policy, referring to statement number 1, the use of all languages is thus permissible as these form part of language diversity and as such there should be no discrimination against any language even if it is a minority language. Indeed the sentiments conveyed here were applauded by many. However, the reality was that as Bamgose (1999) stated, other languages, such as Afrikaans, were developed to a higher status than most native African languages and Afrikaans in this instance was at par or better than English in status (LiEP).

Bamgose (1999) further alluded to the fact that most South Africans did not prefer to send their learners to schools in which the learners were to be taught in African languages. The second statement in the

Language-in-Education Policy (LiEP) (1997) gave South Africans the hope of choosing the language of learning which did not exclude English nor forced them to choose their indigenous languages.

According to the LiEP, the main aims for language usage included:

- a) the promotion of full participation in society and the economy through equitable and meaningful access to education;
- b) the pursuit of the language policy that will be most supportive of general conceptual growth amongst learners, and multilingualism as an approach to language;
- c) to promote and develop all the official languages in South Africa

Based on the aims of the policy, it can be observed that since the African languages were not developed to the level of English and Afrikaans, these intentions might not be possible, Bamgose (1999). Furthermore, there was no clear method as to exactly how the implementation would unfold and what would be the indicators for the accomplishment of these aims. Hence the teacher was left helpless in a multilingual classroom in which s/he was seen to implement this policy and faced by the challenges of assisting learners to access mathematical knowledge and skills especially in Ex-Model C Schools.

The *Language-in-Education Policy* (1997) also makes the following statements:

- The parent exercises the language choice (the document uses the wording 'language rights') on behalf of the minor learner.
- Learners (i.e. their parents) must choose their language of teaching upon admission to a school.

It was explained in this research that the parental role regarding language choice and even school choice was very significant. That is why in this research I wanted to find out the details around this issue through administering a questionnaire to parents. According to the LiEP, even in Ex-Model C Schools, it is the right of the parents to decide that their children should learn in English given that these schools are non-Section 21 (SASA, 1996), and are known for their educational practices including the continued use of the English language regardless of the black learners that might have problems with the English language.

Various challenges to the implementation were explained above. The belief that education in a home language was inferior persisted (Bamgose, 1999). Indigenous languages were perceived as having limited applicability. More practical support had to be provided to schools to assist with the implementation. Minimal support for indigenous languages prevailed at the High School level (Setati, 2003). A clear link exists between effective application of Language of Learning and Teaching (LoLT) and academic achievement. For example, if in Ex-Model C Schools English is used as a LoLT, the learners in a better position to succeed are those more familiar with English who happen to be mostly the first language speakers. Conversely, this situation might put the ESL learners at a disadvantage to access mathematical knowledge, following Zevenbergen's (2000) idea that language can be used as a form of discrimination. The Department of Education sought to encourage learning in mother tongues whilst not neglecting the internationally acclaimed languages such as English which happens to be the language of power and economic access (Setati, 2002).

There seemed to be clear differences between what was intended by policy and what eventually transpired at implementation levels (Auerbach and Tollefson, 1995). Auerbach and Tollefson (1995) explained that language policies were often associated with sentiments pleading for equality and opportunity but lacked clear implementation and realization thereof. The constitution of South Africa spelled out clearly that all languages were equal and should all be promoted without discrimination (SASA, 1995). However, in most schooling institutions, English and Afrikaans were given privilege over African languages (Doe, 1996). Setati (2003) indicated that parents seemed to prefer their children to learn in English even when offered an opportunity to learn in their first language (African in this case). Setati (2003) sought to reveal further underlying challenges to the usage of home languages and the resistance to use them in instruction by the very people who were meant to benefit from such a policy, that is, parents and ESL learners (Zevenbergen, 2000; Bamgose, 1999).

In my experiences as a teacher, the Schools Governing Bodies (SGB's), as policy makers at school level (SASA, 1996), had to ascertain whether the academic needs of the parents and learners were catered for as enshrined in the constitution. In the implementation of the Language-in-Education policy (LiEP, 2006), challenges posed by different racial or ethnic groups in the same school made it impossible to offer all languages equal treatment (Setati, 2003). This happens to be the case especially when there are minority languages spoken by some learners at the school.

Tollefson (1995) stated in his review of “Power and inequality in language education” that issues of power and politics were generally seen as inherent in the language policy and that language education was linked with the distribution of political power and economic resources. Hence in my observation, a clear epitome of this statement could be evident in the fact that the language of Afrikaans was historically developed to a similar status as that of English at the expense of native African languages owing to the fact that during apartheid Afrikaner people were in power. Tollefson (1995) further alluded to the fact that language policies at all levels, from national authority to the individual classroom, reflected relationships of unequal power. This meant that the spread of English was part of the wider social, political and economic processes that contributed to economic inequalities.

Tollefson (1995) pointed out that the roles of teachers and learners were rooted historically in the relationships of unequal power that characterized contemporary society. This implied that language could no longer be used only as a tool for teaching but also as a tool which services other political and social goals, such as economic access or even lack thereof. My view is that the Ex-Model C schools curricular materials and even physical arrangements of space are a reflection of unspoken assumptions about power in the society outside the classroom.

Given what the literature says about power and inequality in education, the educators and learners become subject to the challenges of learning a second language. Adler (2001) alluded to one of these challenges, which is the lack of mathematical registers in most African languages amongst learners attending Ex-model C schools in town. Most educators are viewed to be attempting to implement the LiEP as dictated since they are seen as agents who might bring change (Adler, 2001). However, due to challenges posed by multilingual education, they end up frustrated, implying that their teaching abilities might be compromised.

2.6 CONCLUSION

In this chapter I discussed the work of Lave and Wenger (1991), on the notion of the socio-cultural perspective as a lens for viewing Ex-Model C classrooms. Also discussed was how the English language could, though not intentionally, be used as an instrument for discrimination against ESL learners in the Mathematics classroom (Zevenbergen, 2000; Barwel, 2003). Discrimination against native languages was also noted in and explained from the UNESCO (1994) report. In the work of Setati (2005a; Setati 2003), I explained how power struggle existed among languages, with English having the upper hand due to the social goods it provided to the second language learners and parents. An explanation was also

offered on the difficulties educators face when using mother tongue languages, mainly the shortage of registers (Adler, 2001). This shortage of registers of registers creates language discourses (Moschkovich, 1996) such as code-switching and re-voicing will form an integral part of my research. The intentions of the LiEP (1997) were explained, especially the challenges relating to the implementations at lower levels, that is, schools. I concluded my literature review discussion by looking at the challenges facing policy implementation as expounded by Tollefson (1995); the fact that what was intended by policy was not always what got to be implemented by those at the ground levels, that is, educators and learners. The views presented by these authors, the conclusions, inferences, and learning models will inform this research's theoretical framework in the next chapter.

Chapter Three

THEORETICAL FRAMEWORK

3.1 INTRODUCTION

The theoretical framework will be guided by the underlying notion of the *community* and *practice* by Lave and Wenger (1991). According to Lave and Wenger's theory (1991), there are three elements of a community of practice. These are the *domain*, the *community* and the *practice*. In this study, the Ex Model C classroom is viewed as the community, the domain is the unique multilingual setting of learners and the practice is the use of languages in the mathematics classroom. The language practices in such classrooms reveal the cultural, social, political, linguistic dilemmas and discourses (ways of being in the world, through interaction and engagements (Moschkovich, 1999) created by learners' quest to obtain mathematical knowledge. A situated and socio-cultural perspective, according to Lave and Wenger (1991) is a way of viewing both cultural and social practices of a setting in order to get more understanding of the prevailing discourses, for example, how language is used in a Mathematics multilingual classroom. In this chapter I discuss the theoretical framework that informed my study. In this framework I have focused on the language uses and challenges which I refer to as language dynamics.

3.2 A SITUATED SOCIO-CULTURAL PERSPECTIVE

Lave and Wenger (1991) explained that a community is a unique company of individuals who share common goals, interests and visions and are able to derive their own learning. Though they remain part of the global community, their uniqueness sets them apart from other individuals and other communities. Lave and Wenger (1991) further explained that the domain is like a sphere of existence or special environment with its own different characteristics, features or settings. It is not any ordinary individual who is a member of this community that might be able to function in such a community, but those who share its common goals and interests. Lave and Wenger (1991) defined practice in terms of behavioral patterns or actions that define the nature of the individuals. The practice could be the aspect that brings the individuals together in a community and reflects the common identities for a domain in which the pursuit of achieving common goals is essential.

The **community** in this research refers to the Ex-Model C classes. These schools are located in a town, or well developed area and comprise a majority of township learners from Section 21 schools, which are schools that are located in black townships or settlements which were previously disadvantaged in terms of educational facilities by the apartheid government (SASA, 1996). The majority of educators in the chosen Ex-Model C schools are *white* and the school buildings and resource facilities are much better than those of Section 21 schools (mostly *black* schools). The parents of Ex-Model C School learners are part of the working class society (Barwell, 2003) who aspires for better social status, employment and technologies for their children and these parents might have an influence regarding where their learners should attend school, such as attending an Ex-Model C School. These parents, as Setati (2005) noted, are part of those that value social goods. These social goods refer to better education, employment, technology, and easy access to higher institutions which only the English language can afford access to (Gee, 2001). The attainment of these social goods could be a common vision for learners attending Ex-Model C Schools.

The **domain** is that of a multilingual mathematics society, with unique features of diversity. One of the common goals for every learner is to become better than what they would have been had they remained in township schools which are characterized by poor education. Part of the focus of this research, however, was how ESL learners could be afforded the opportunity to utilize the available language resources to access mathematical concepts. In this domain, the influence of language is key since some of these learners could be faced with challenges such as the use of English as a second language. This can be a barrier for their success in Mathematics (Zevenbergen, 2000) given the fact that English is the main language of learning and teaching. This research aims was to investigate possible language practices that could have been adopted to accommodate ESL learners.

The **practice** constitutes language challenges or discourses (ways of being in the world through interactions and engagements that arise from the language interactions) which may be significant in providing more understanding as to how Mathematics is learned. In the context of this research the term discourse refers to the different language practices or challenges of the Ex-Model C Schools. For example, learners might have experienced challenges in using a certain English words and hence decide to switch languages, for example, from English to an African language.

3.3 THE SITUATED AND THE DISCONTINUITY MODELS

The language discourses, which include the use of languages in social settings (Moschkovich, 1996), might reveal language dilemmas (Adler, 2005; Zevebergen, 2000). Adler (2001) explained how language dilemmas in a Mathematics classroom could lead to incorrect interpretations and subsequently to poor performance. These barriers to learning Mathematics would land themselves in discontinuities (Moschkovich, 1996). The discontinuity model by Moschkovich (1996) is evident when language usage could no longer assist the teaching and learning of Mathematics. An example is when learners do not understand an English mathematical term such as “transpose”. This term is mostly mistaken to mean “take it from one side of the equation to the other side” and the translation into most African languages is merely transferring, hence the “sign” (positive or negative) of the number being transposed could be ignored. On the other hand, other language discourses reveal how language could in fact be used as a resource for learning mathematics, that is, a situated model, as Moschkovich (1996) explained. For example, code switching, code mixing, translation, interpretation, re-voicing, etc. might be evident. This is because one language might complement the shortcomings of another as long as the concept is put across more plainly to the learners. Furthermore, though one language resulted in a discontinuity, the presence of other languages was used to assist either by re-voicing, translating, code-switching and so on. In this study these discourses constitute language dynamics. It was therefore interesting to observe how these language discourses manifested in Ex-Model C multilingual classrooms.

The language discourses mentioned above result from the fact that learners bring different proficiency levels of English and different cultures to Ex-Model C Schools since they come from different classroom environments where some were taught partly in English and partly in other African languages. Hence both the teacher and ESL learners could use other means of communicating Mathematics such as the use of mother tongue. This practice is assumed to occur in the broader spectrum of intended language practices as enshrined in the LiEP and the constitution of South Africa (SASA, 1996 and DoE, 1996). As stated in the preceding paragraphs, this study employs a situated and socio-cultural perspective which assumed that the use of language(s) takes cognizance of culture (Moschkovich, 1999) of the school, the prevailing culture of the mathematics classroom as well as the cultural and linguistic diversity of the people who constitute the community of the classroom (Barwell, 2003). Furthermore, it was assumed that the implementation of the Language-in-School Policy (LiEP, 1996), by educators and learners might be enhanced or hindered by the culture of the classroom.

3.4 HOW THE THEORETICAL FRAMEWORK WILL BE USED IN THIS STUDY

The application of Lave and Wenger's theory, as showed in Figure 1, implied that multilingual classes of Ex-Model C schools comprised learners who shared common identities, interests and repertoires. Repertoires, according to Lave and Wenger (1991) are unique identities that develop through a series of learning encounters resulting in a change of behavior, personality, perspective, etc. This change of behavior is then internalized and owned by the individual. In my experience as an Ex-Model C educator and through my casual observations, Ex-Model C School learners perceive themselves as better than township learners and have developed a higher level of self-esteem and well being by comparison. This is because of their English language proficiency which township learners might not have. In fact, I have observed that in most Johannesburg townships and other towns, the Ex-Model C school learners are referred to as "Model C's". This suggests that a new identity of all learners attending Ex-Model C schools is being developed, with emphasis falling on "correct" English accent and fluency in the language. It can be argued that to some extent, these learners have obtained the linguistic capital to purchase social goods (Barwell, 2003; Zevenbergen, 2000; Setati, 2002).

Setati (2002) observed that parents would rather abandon their constitutional right for their learners to learn in their mother tongue in favor of English in order to purchase social goods (Gee, 2001). Ex-Model C learners are an epitome of the political power of English with a better linguistic capital than any other language (Setati, 2001). The Language-in-School Policy as stated in the constitution of South Africa (Doe, 1996) stipulated clearly that all learners had a right to learn in any of the eleven official languages. This was further supported by the views expressed in the UNESCO(1994) report in which the promotion of multilingual education was among other aspects recommended for application at all levels of education. This move sought to achieve political justice and the empowerment of all the previously marginalized languages. However, most South African communities prefer the social goods (Gee, 1991) which only English as a language of power could provide (Setati, 2001).

During the data collecting process of my study I foresaw that certain languages might be marginalized or incorporated in one or other form in the teaching process. Hence, the notion of a Mathematics community and language practices prevailing in the Ex-Model C classroom were taken as guide posts in assisting me to gain deeper understanding of the challenges teachers face in implementing the language-in-school policy. This is particularly due to the fact that Ex-Model C classrooms were formerly

dominated by the use of Afrikaans or English. The notion of a community in this instance meant that in this study, the classroom would be seen as engaged in language practices that could include the language discourses alluded to earlier. The use of the 'situated model' (Moschkovich, 1996) and other linguistic practices that support participation of ESL learners in mathematical discussions such as the use of gestures, artifacts and re-voicing, might become necessary to build the language of mathematics (Moschkovich, 1996; 1999). Re-voicing, according to Moschkovich (1996) meant identifying what the learner means against what the learner wanted to say. For example, in describing parallel lines, the learner might say: "equal lines", instead of "equidistant apart."

According to Moschkovich (1999; 2002) there were three perspectives that could be used to view how learners gained competence in mathematical communication in multilingual classrooms. The first could be used to focus on the acquisition of mathematics vocabulary, the second may focus on multiple meanings across registers and the third focused on the socio-cultural and situated view of the use of language and Mathematics learning. Moschkovich (2002) says that the 'discontinuity' model could be used in determining how learners mapped meanings across registers, e.g. moving from everyday talk in ordinary language (which could be English or the learner's main language) to mathematical talk in the language of instruction (Adler, 2001). Mathematics talk is the process of engaging with the Mathematics concept by expressing it in more mathematically understandable terms. It is almost like breaking down or extracting the Mathematics code, expressed through mathematical symbols. For example, such practice is more evident in word problems being written in a number/equation form, e.g. Jimmy is twice as old as Sammy. In mathematical symbols this is equivalent to: $J = 2S$, in comparing their ages.

Moschkovich (2002) contended that the discontinuity model also provided insight into how the teacher used language to focus on mathematical constructs such as *if, then*. On the other hand, she opined that the situated model viewed learning in a community using social, linguistic and other classroom materialistic resources to learn to mathematize (decoding of the Mathematics language) situations and use their languages to talk about these situations. In my experience, most learners in Ex-Model C Schools are fluent in the English language. However it is the Mathematics language that becomes a challenge because it is decontextualised from their familiar environments (Barwell, 2003; Moschkovich, 1999). These contexts might include word problems, mathematical investigations and group discussion scenarios. In such classroom interactions ESL learners might require further clarifications using familiar contexts, for example, mathematical problems dealing with derivation of a mathematical coded equation from a word problem. Hence in my teaching experience I have used similar scenarios and daily life examples, which is daily informal Mathematics talk, to show similarities where possible. It is in this

manner that learners began to understand the Mathematics, which is mathematizing everyday experiences that are familiar to their backgrounds.

THE THEORETICAL FRAMEWORK DIAGRAM

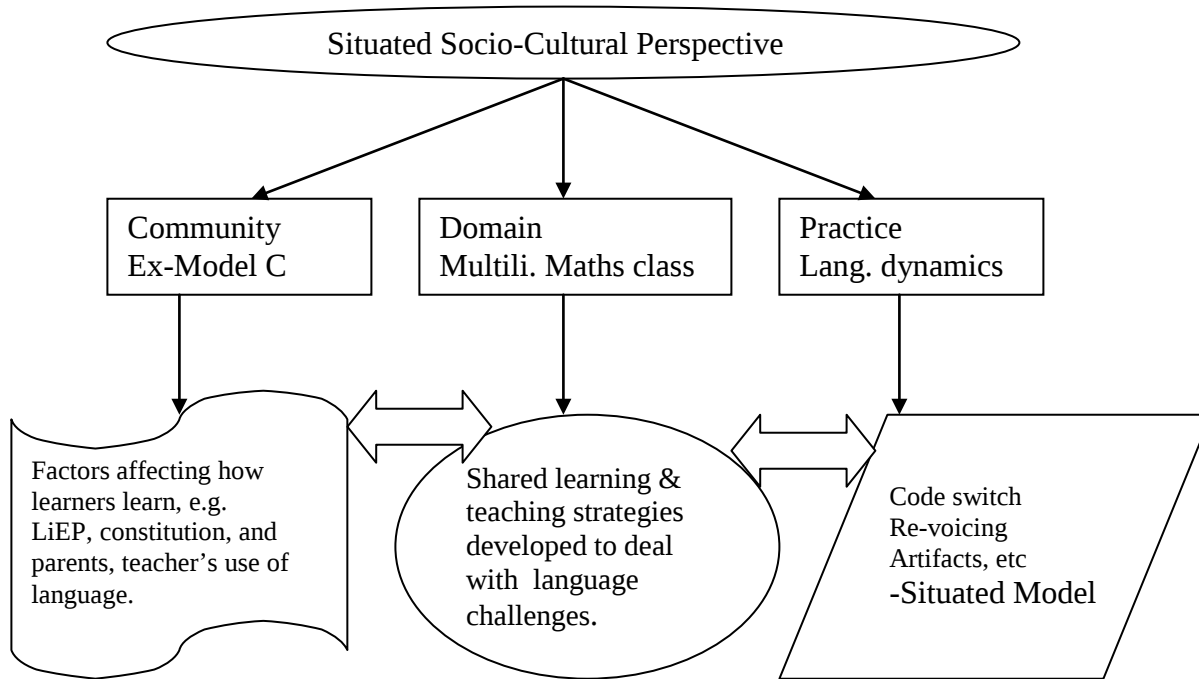


Figure 1.

3.5 LANGUAGE DISCOURSES/CHALLENGES

3.5.1 CODE-SWITCHING

Code-switching is another practice that was adopted in the Ex-Model C multilingual classrooms. According to Setati (2002), code-switching can be between discourses, registers and dialects. It can be between discourses where on the one hand there exists a problem of constructing an English sentence, while at the same time the challenge of solving the actual mathematics problem that is at hand. It can be between registers and dialects in which the English written code has to be translated into a Mathematics one in order to derive a mathematical solution. Code-switching is defined by Adler (2001) as the use of more than one language in the same conversation. This notion of the practice could be used to describe how it was visible in the classroom and for what purposes it was used. Code-switching, according to Setati (2002) can be used for the following:

- To emphasize a point;

- For ease and efficiency of conveying a mathematical expression;
- To repeat in another language for clarity, and
- To state a term because it is not yet known in the language used

Code-switching was observed in some studies as a discourse where it was used for conceptual discourse and in some instances as the language of solidarity (Setati, 2003; 2005b). In multilingual classrooms it can be used to explain difficult concepts which learners do not understand when presented in the medium of instruction.

The process of code-switching

During my data classroom observations an instructive example of the process of code-switching was the scenarios in which a word was uttered in an African language (or English) due to language discontinuity (Moschkovich, 1996) especially in the language of learning and teaching. A specific example could be when learners discussed how to do a mathematical task and while the conversation was in one language, e.g. English, then in the same sentence that learner began to use another language, e.g. seTswana. Concrete classroom examples involved the following:

1) When the learner talks to another learner while trying to solve the following problem:

$$2x - 4 = 6$$

“tsaya - 4 aye ka mo right”.

The sentence is translated in English to mean, “Transpose -4.”

The word being translated from English is “transpose,” which is equated to the Setswana word, “tsaya”. This happens because the learner in this instance did not know the English mathematical term “transpose” but fortunately the learners knew the process of transposing.

2) When the educator addresses the class and suddenly switches to the learners’ majority language:

“I told you that when you convert from centimeters to metres *le tla divayida ka* 100”

The words used in seTswana “le tla divayida ka” in English mean, “you will divide by.” While the educator was explaining the process of converting she might have realized that some learners might not know the process involved in converting and explaining in English could make matters worse, and hence

decide to switch language codes and explain in another language. By switching to the learners' language the learners might get a better sense of the process and probably get it right.

3) When the learner talks to the educator:

The learner might begin asking the educator a certain question in the LoLT and due to the lack of registers or a limited LoTL vocabulary, decide to switch codes:

“Madam can you please explain go re karabo e le oe fumane jang?”

The seTswana words “go re karabo e le oe fumane jang” in English mean, “how did you get the answer?”

Essentially, the learner was saying that s/he can express and understand part of the problem (in English) but the manner in which the final answer was arrived at did not make sense (in seTswana). This is important in this study because switching to another language carried underlying messages of language dynamics and not just switching for its sake.

Code-borrowing as part of code-switching

In this study code-mixing will be one of the language practices that are part of code-switching, that is, a sub-theme. Code-borrowing happens because some English words had been adopted from most African languages and treated as pure African language words (Setati, 200). For example, paper = “phepha”, book = “bhuku”, etc., and others had been used as part of both languages, especially during Mathematics lessons.

Code-borrowing was expected due to the fact that as the learners used their languages, there were likely to be words which had their origins in the LoLT but due to the fact that they were not available in vernaculars they were used just as they were although the spelling was that of the vernacular language. Learners might have uttered statements such as:

“Wena o kwetsi eng ko *bhokong* ya gago”

The word “*bhokong*” is derived from the English language. This could be because the learners might have been more used to English to such an extent that they had forgotten the words that should have

been used in their mother tongue. The main language for this utterance is seTswana. However, due to the lack of registers the learners used English words as if they were acceptable seTswana words without losing the intended meaning. This practice might suggest a strategy through which African languages could be developed.

Code mixing as part of code switching

Code-mixing happens because some English words have been adopted by most African languages and by attaching a prefix or suffix are treated as pure African language words Setati(2000). In cases where the ESL learners have gotten used to English so much that they have probably forgotten the vernacular words, it is possible that they engage in code borrowing. This might happen more often in cases where there are no registers available in vernacular languages. According to Li (1998; 2000) code-mixing refers to any admixture of linguistic elements of two or more languages. Some languages are more dominant, through their frequent use and availability of Mathematics registers, such as English whilst other languages adopt most of their words from them. The words used might consist of a prefix or even a suffix from another language, commonly from the vernacular languages. In this study this practice is expected to be one of the strategies that the learners would have developed to address the challenges of lack of registers and multilingualism. The following few examples might form part of this practice:

- 1) Learners might say “ **i-peni**” while actually referring to “a pen”. The word “pen**i**” has been borrowed from the English language and by attaching the prefix and the suffix “**i**”, the word sounds vernacular.
- 2) Learners might use other words such as “**le**-equation”, “**ama**- sums”, “**i**-function”, etc.
- 3) Also other words might be “**kwi**-maths”, **ku**-step number 2”.

The above are among the common practices that might be encountered through the process of code mixing and as mentioned, mostly employed as a perfect strategy for compensating for the lack of registers and multilingualism.

3.5.2 RE-VOICING

Moschkovich (1999) explained re-voicing through a series of interviews with a teacher and learners. Re-voicing, according to Moschkovich (1996) means identifying what the learner means against what the learner wants to say. Re-voicing is helpful in identifying what the learners mean against what the learners wants to say. This is done so as to build the language of Mathematics in the learners. In this study the other forms in which re-voicing might occur could involve repetition, interpretation and translation of mathematical statements. For the purpose of this study, these are sub-themes under re-voicing. These sub-themes might be evident when, should a learner not understand the English explanation or LoLT, an alternative explanation in another language, e.g. seTswana, is used, as in code-switching (Setati, 2005b). This might also be due to the lack of registers in one language (Adler, 2001). In this conceptual discourse the classroom is a multilingual one in which such practices can become dominant and re-voicing used as a strategy to deal with such language challenges.

The process of re-voicing

It has been mentioned that the ESL learners might experience challenges in expressing their thought processes in the acceptable LoLT (Moschkovich, 1996). The person in a better position to intervene would be the Mathematics educator. Consequently, the process in which re-voicing might occur in the classroom during the Mathematics lesson can involve utterances which are perhaps incomplete or learners have used an unacceptable word in the LoLT. These would need to be processed by the educator in order to improve the learners' mathematical language.

The example that is used in her paper, Moschkovich (1996) was when a learner described the rectangle as parallel. The educator went on to repeat the word "parallel" a few more times and asked the learner to explain what he/she meant, against what she said. As stated earlier, that re-voicing, according to Moschkovich (1996) means identifying what the learner means against what the learner wants to say the learner might use the word "equal" instead of "parallel" as these words are not too different from each other. During this process of re-voicing, the teacher may assist the learner to develop the mathematical language by intervening through guessing what the learner intended to say. The teacher would then quickly re-voice it back to the learners using appropriate mathematical terminology. These practices might be frequent in Ex-Model C Schools to assist the ESL learners.

3.5.3 MATHEMATICS TALK, ARTIFACTS, FORMAL AND INFORMAL MATHEMATICAL LANGUAGE

Mathematics-talk, is one of the discourses that was encountered in this research and involved the mathematical discussions that both the teacher and learners engaged in, regardless of the proper mathematical syntax or language (Setati, 2002; Adler, 2001). These were mostly informal and also involved the use of artifacts. Adler and Setati (2000: 249) stated that: “Informal language can be referred to as the kind that learners in their everyday lives use to express their mathematical thinking”. For example, learners in their everyday life may refer to a half as any fraction of a whole and hence can talk about dividing a loaf of bread into ‘three halves’. The multilingual classroom community that the learners find themselves in might require that these practices become part and parcel of their daily mathematics-talk in an effort to express their mathematical ideas.

Adler and Setati (2000: 248) further explained that formal mathematical language referred to “the standard use of terminology, that is, mathematical register”. One difficulty facing all teachers, however, was how to encourage movement in their learners from the predominantly informal spoken language with which they were all fluent, to the formal language that was frequently perceived to be the domain of mathematical activity. This challenge was expressed by Adler and Setati (2000: 250) in the following manner:

“ ... how teachers and learners navigate between languages and discourses and so the issues involved in moving between informal spoken mathematics (in the main language) and formal written mathematics (in English)”.

This meant that while learners would be more accustomed to the informal use of English, leading to informal Mathematics language, they further needed to learn formal mathematical concepts.

The process of using Artifacts

It is necessary that an educator developed further strategies to facilitate the understanding of certain mathematical concepts, words, questions and statements through teaching learners standard use of mathematical terminology (Adler and Setati, 2000). In cases where such terms are not available, the process of artifacts which involves body language, the use of familiar contexts, and even the teacher’s personalized examples can be harnessed (Barwell, 2003). As learners engaged in Mathematics talk by

mathematising (Setati, 2001) they developed from informal to formal mathematical language. However, it will be during such transition that their mathematical terminology and conceptual understanding need assistance.

Examples of instances where artifacts can be used might involve the following:

- a) The use of a similar simpler example to the one being discussed, that is, if the questions is about converting in certain units, from meters to kilometers, the educator might discuss other much simpler converting tasks involving millimeters to centimeters (Moschkovich, 1996). The educator might say: “Now, let’s first look at how you converted” This will be done not only to show similarity between the two but also to build confidence in achieving the task of converting, as Lave and Wenger (1991) point out.
- b) The use of common backgrounds based of socio-economic factors of the learner (Barwell, 2003). While discussing a problem about payment of workers per month the educator might engage learners in a personalized example to work out their own payments if they worked certain days. The educator might begin by saying: “Let me give you my example....” This will be done in order to view the task in a more meaningful manner (Barwell, 2003).
- c) Finally, by demonstrating to the learners exactly what to do, whether by writing on the board, or telling them directly. The main aim is to model to the learners what they should do in their process of developing and becoming better.

It is clear therefore that these language practices were designed to close the language gaps as a result of language. They thus formed part of the strategies that could have been developed by the Ex-Model C learners and educators to access the mathematical knowledge. The three main themes discussed in this theoretical framework will be the main focus for the methodology and analysis.

3.6 CONCLUSION

The theoretical framework discussed here was guided by the underlying notion of *community, domain* and *practice* by Lave and Wenger (1991). It was explained how the theoretical framework would be used in this study. Reference was made to the possibility of language practices that are prevailing in Ex-Model C Schools to reveal the cultural, social, political and linguistic dilemmas (Moschkovich, 1999) created by learners’ quest to obtain mathematical knowledge. There lies a potential for the interplay between the two models of learning as explained by Moschkovich (1999) that on the one end the discontinuity model would end at the language challenge to learning, whereas the situated model would

assist in bringing in other resources situated within the language to promote and compensate mathematical learning. It was in this manner that the learning of Mathematics for ESL learners was envisaged to have been made possible. In gaining more understanding to the challenges of language such as code-switching as Setati (2002) explained I have alluded to how these challenges could be perceived from a situated socio cultural perspective.

Chapter Four

RESEARCH DESIGN

4.1 INTRODUCTION

In this chapter I explain my research design, particularly the various stages through which it was conducted. In this chapter I explain the trustworthiness of my research. Firstly, I discuss the ethical values that I followed in my study then continue to justify why I chose a video recording as the main data collecting instrument. I further elaborate on how I ensured non-interference with the learning experience during normal school teaching and learning, a necessary prerequisite for a successful case study (Shuttleworth, 2008). I sought to use a more reliable method in order to view and re-view my data and thereby arrive at valid conclusions. I justify why I chose 5 consecutive days to capture the data and I also shed light on why I used three data collection methods.

In the first sections of my methodology, I explain how I actually went about doing my research from the onset. This includes getting the consent of all the people involved, especially the respondents, setting out the criteria for the selection of schools, the grade, selection of respondents, justifications for the use of data collection instruments and explaining precisely how the data was captured through qualitative and quantitative methods, why this report presents a case study, and importantly how I have observed ethical conditions. Spring (1997: 1) stressed the importance of maintaining focus through research questions by stating that “The researcher establishes the focus of the study by forming questions about the situation or problem to be studied and determining a purpose for the study.” This study has been designed in such a manner that it will address the research questions as its main focus.

4.2 RESEARCH PREPARATIONS

4.2.1 CRITERIA FOR THE SELECTION OF SCHOOLS

The choice of my schools depended upon 4 important reasons:

- a) An Ex-Model C High School with a multilingual setting had to be chosen according to the research topic;
- b) A school had to be accessible to the general community, for example closer to the taxi rank, and with reasonable school fees;

- c) A most appropriate school had to be one whose principal understands research and its influence on educational trends, such as transformation, and
- d) The school had to be willing to give their support in identifying a teacher and class for the conducting of my research at a time suitable for the teacher and school.

4.2.2 CRITERIA FOR THE SELECTION OF THE GRADE

I chose Grade 9 due to four main reasons:

- a) It is in the GET band that I am facilitating as a district official and I would like to incorporate my study into my work situation;
- b) It is the end of the GET band/phase in which basic concepts of mathematics are required for the FET band/phase;
- c) Second language learners (ESL) at Grade 9 have developed sufficient English proficiencies to communicate mathematical concepts, and should be aware of how language influences their learning;
- d) Learning and teaching is still more flexible and relaxed to allow for diverse teaching styles, like OBE teaching methodology, and stimulate learners' thinking in various ways, that is, timeframes and work schedules could be suited to learners' needs, and
- f) Learners are also aware of how their choices influence their lives in future, as well as their constitutional rights.

4.2.3 OBTAINING PERMISSION FROM THE AUTHORITIES AND SCHOOLS

I wrote a letter to the District Director of Gauteng West District, seeking permission to conduct my research in the schools under her jurisdiction. Permission was given in a formal letter (See Annexure G.) When permission was granted, I proceeded to speak to the 3 principals where my research was to take place. (I did speak with them before, in order to ascertain if they could allow me to use their schools for research.) After formal telephonic interviews with the schools, I visited the schools and they confirmed their support and agreed to assist me. The school officials also made further arrangements with the teachers and classes where data collection was to occur. I gave the principals of the three Ex-Model C Schools letters of consent, in adherence to ethics requirements (See Annexure G), which they gladly signed and handed back immediately so the study could commence.

This research was to take place at the 3 Ex-Model C High Schools. The Ex-Model C School in which the main part of my research was to take place was selected due to the fact that this particular High School was easily accessible to most learners because of its location in Krugersdorp. It is situated near the taxi rank and more accessible to the public of the nearby black townships. It was at this school that I could do classroom observations for a consecutive 5-day period. The other two Ex-Model C Schools could not be selected as the main research sites as I was not able to do classroom observations for a consecutive 5-day period. This was due to the educators' time-tables for Mathematics which were not conducive for a continuous five day observation. As such, only one school became the main focus of my study.

4.3 CONSENT FROM ALL RESPONDENTS

I also met the three educators who took part in the research and explained my research project. In accordance with ethics rules, I explained that there was no need for special arrangements during data collection that might interrupt their normal teaching lessons. The main objective was to videotape the classroom lessons and observe silently. The educators gave me their personal time-tables so I could see the appropriate times for data capturing. They were willing to assist me in ensuring that when learners submitted their consent letters and questionnaires, these were stored safely. I explained that I was going to observe them for at least 5 consecutive days. I provided them with the following consent forms:

1. explaining my research;
2. for participating in the research and
3. for video capturing. (See Annexure F).

When the consent forms were signed by the learners, educators and parents, I was ready to commence data capturing.

4.4 METHODOLOGY

4.4.1 EMPIRICAL SETTINGS

This research was conducted in 3 Ex-Model C High Schools in 3 Grade 9 classes in Gauteng West District, Johannesburg, South Africa. The sample included one classroom, one teacher and about 30

learners from each school as participants in the study. This meant that approximately 90 learners in Grade 9 from 3 different Ex-Model C High schools were to be involved in this study. However 69 learners returned their questionnaires.

4.4.2 THE SAMPLE OF THE PEOPLE TO BE INVESTIGATED

The sample of people to be investigated included the learners, the 3 educators of the 3 high schools, and the parents of the learners who gave consent. The *learners* are important for this study because the data was collected during classroom lessons, especially the encounters relating to the usage of languages during the teaching and learning of mathematics. They were to be investigated through classroom observations, questionnaires and interviews. The *educator* was also investigated as the main person in a position to implement the Language-in-School Policy in his/her classroom. The teacher was to be investigated through classroom observations and interviews. Parents of learners constituted another sample and they were only requested to complete questionnaires. The reason for inviting the parents was to ascertain reasons why learners attended Ex-Model C Schools since *parents* play a significant role in deciding which school their children attend, including the attending of Ex-Model C High Schools. There was a need to investigate possible reasons for choosing Ex-Model C High Schools given that these schools were a bit further from the homes of ESL learners and the school fees were more expensive compared to the fees paid in location schools..

4.5 THE RESEARCH METHODS

This research report presents a case study in which qualitative and quantitative data collecting instruments were used. Spring (1997:2) highlights the advantages of a case study as follows:

Case study research excels at bringing us to an understanding of a complex issue or object and can extend experience or add strength to what is already.

The context of Ex-Model C Schools is very special and thus has become a special case of interest for research. Spring exposes some of the challenges to using a case study by highlighting that,

Critics of the case study method believe that the study of a small number of cases can offer no grounds for establishing reliability or generality of findings. Others feel that the intense exposure to study of the case biases the findings. Some dismiss case study research as useful only as an exploratory tool. (1997: 2)

Much as Spring's (1997) last points alerts us to the limitations of case study research regarding reliability and generality, this study will add insight to knowledge about teaching and learning in Ex-Model C Schools.

The purpose of this study was mainly to investigating the use of languages of both the teacher and learners in their classrooms. Data collecting methods included questionnaires, interviews, and video recordings. The questionnaires were completed by learners and parents. Video recording was used to capture the activities in the classroom where the researcher recorded as a non-participant. Three learners were selected for interviews to provide more insight and to verify certain issues, including their views on how languages were used. The three data collecting methods ensured that other perspectives of data collection were available for verification and data triangulation (Opie, 2004). Data triangulation is important to ensure that data from one data collecting instrument can be compared to the one from others. For example, in the questionnaires, learners indicated that they used only English when learning Mathematics, while the classroom observation revealed the extent to which they utilized other languages. In such a case the data from the classroom observations proved to be more valid and reliable than the one from the questionnaire.

4.6 DATA COLLECTION

4.6.1 VIDEO-TAPING (THE MAIN DATA COLLECTING INSTRUMENT)

The video recorded data was a record for viewing and reviewing of the data (Sharon, 2007). The advantage of video recording is that the data can be viewed repeatedly and from various perspectives so for better interpretation. This also meant that the actuality of the scenarios under investigation were to be transcribed, classified (line numbered) and color-coded (themes) according to the main guiding/research questions and pre-established themes. Spring (1997) further comments on the multiplicity of data collecting instruments especially for ensuring triangulation:

The researcher investigates the object of the case study in depth using a variety of data gathering methods to produce evidence that leads to understanding of the case and answers the research questions. Spring (1997: 2)

Thus, in capturing the data I considered the following aspects for video recording and I have provided the necessary justifications in each case:

4.6.2 THE ACTUAL RESEARCH

The research took place over a period of 5 consecutive days and video recordings took place on 3 of such consecutive days. The initial two days were for taking field notes and to familiarize myself with classroom interactions. Moreover this was done to ensure that the researcher (myself) would be viewed by both learners and the educator as part and parcel of the classroom to minimize distorted reactions from the respondents (Spring, 1997).

During the first day of my research I collected the remaining consent forms from the learners as well as on the second day in preparation for the actual video capturing. I handed out questionnaires for the learners to fill at their own pace and to submit the following day or as soon as they were ready. I asked them to request their parents to complete the parents' questionnaire. I also spoke to the learners requesting their co-operation, regarding the submission of all their consent letters and questionnaires. This procedure was done in all 3 Ex-Model C High Schools.

4.6.3 VALIDITY AND RELIABILITY OF THE MAIN DATA COLLECTING INSTRUMENT

Opie (2004) explains that in order for the data to be valid, it should be authentic, trustworthy and within the researcher's research goals. Hence my data would not be valid if for example, my instrument had captured different video scenes that have no relation to educational and mathematical discussions as proposed.

The validity of my research could be authenticated by the fact that the video recorder captured the data scenes and classroom lessons exactly as they unfolded, that is, what and how those events happened from the time the educator entered the classroom until the end of the mathematics lesson. Hence the actuality of the captured events could not be denied or disputed and neither could the words uttered in the video be reversed, rephrased nor altered once they have been spoken. The transcripts which were written by the researcher could also be verified against the video recordings. It is for this reason that the video recording was said to be the most trustworthy instrument for collecting data (Opie, 2004).

4.6.4 CRITERIA FOR OBSERVATIONS AND VIDEO RECORDING

I decided on the following criteria and procedure for the actual observations and video recording:

1. Observations and field notes for at least two lessons prior to video capturing were made. The reason for this was to ensure that both the learners and the educator would be used to my

presence. This was also done to ensure that, during my video capturing, I record relatively authentic educational events and encounters in order to avoid acting and pretext. This was also done to ensure that the study is reliable and valid.

2. Consecutive observations were made as far as possible to ensure continuity, focus and consistency from the respondents and the researcher. This was only possible in one school, which is the main reason why it was selected as the main school in which the research would be carried out.
3. During the actual video recordings the focus was on the activities of the teacher as well as those of the learners (in their groups) and by doing so I was able to capture the presence of other languages and how language(s) was/were used in the classroom. Hence, suitable focus positions for the camera were used and I was able to move from one group of learners to the next, as they were seated in groups in all the 3 Ex-Model C Grade 9 High Schools.

I captured scenes in which issues relating to language usage were to be examined. I recorded articulated phrases and statements which would not have been easily done through another instrument. According to Hatch (2002), this is necessary because the data captured has to be transcribed and used as valuable excerpts and quotations around which generalisations could be made. In ensuring validity to the generality of the claims that will be made in this report, Spring (1997:3) further explains that:

External validity reflects whether or not findings are generalisable beyond the immediate case or cases; the more variations in places, people, and procedures a case study can withstand and still yield the same findings, the more external validity.

In this study some of the findings will be generalisable and can provide more in-depth insight to the language dynamics prevailing at Ex-Model C Schools in South Africa.

4.6.5 CONDUCTING THE RESEARCH – CLASSROOM OBSERVATIONS

A) WORK AREA

The classroom was spacious enough to move from one spot to the next to capture group conversations. The educator was also visible enough and every word spoken was captured clearly. In all my movements and capturing of learning events, I did not disturb the normality of the classroom or diverted all attention to my research work.

B) PERIPHERAL WORK SPACE – REACH-ABILITY

I was able to move freely within the classroom. I was also able to divide my shooting into different aspects. It was possible to capture the educator's activities fully by focusing the video camera in her direction and movements during the instructional phase of the three lessons. Thereafter I focused on particular groups of about four to six learners discussing their work. I was able to hear and record different languages being spoken and to gather possible reasons for learners to do so.

C) EDUCATOR INSTRUCTIONAL WORK

The key aspects of my focus on the educator was the manner in which she used language to deliver her lessons, that is, giving of instructions, introduction and expectations for the lesson. The interesting moments were the times during which the learners did not seem to understand or meet the expectations of the teacher. I was able to capture such events including the rest of the classroom proceedings. I was interested in the manner in which the educator used language to assist learners to understand better, especially whether she saw a need to use learners' languages through code-switching as well other teaching strategies developed to assist ESL learners.

D) LEARNER INTERACTIONS

This aspect was one of the areas of focus for my research, that is, the verification of the presence of other languages in the classroom and how these could be used for learning and teaching. I was hoping also to capture group conversations of learners that would confirm the presence of African languages and especially the dominant ones in the classroom since this would answer one of my research questions. The frequency with which the use of other languages other than English occurred was also noted. Of critical importance was whether the educator was aware of such language dynamics in her classroom to incorporate such in her teaching as she interacted with learners.

4.6.6 QUESTIONNAIRES

There were two questionnaires, for the learners and parents. The reason was so to ascertain the perceptions, attitudes and realities of language dynamics as the driving force behind the manner in which both groups use language. The questions were structured in such a way that they would provide insight to my research questions. The questionnaires were divided into two parts. For learners there were 10 closed questions (a scale ranging from 1 to 5) and 10 open-ended questions, while for parents there were 10 closed questions and 9 open-ended questions. (*See Tables 1 – 8*). In the following chapter, the analysis, I further explain how these two parts were analyzed; that is, the closed section was analyzed

through the use of quantitative methods of finding average/scores and the open-ended part was analyzed using predetermined themes.

The questionnaires were given first to the learners and the set for parents was taken home by the learners who returned them to the researcher as soon as the respondents had completed them. Hence there was no pressure placed upon them to complete the questionnaires. They were encouraged to return them as soon as they were ready.

4.6.7 INTERVIEWS

I was able to conduct two types of interviews consisting of 7 to 9 questions. One was held with the educator (7 questions) and the other with 3 learners (9 questions) in each of the three schools. The interviews were to ascertain the views of the respondents pertaining to the language usage in Mathematics. In order to capture all the responses clearly, the interviews were video recorded and transcribed. The respondents were interviewed separately and asked one question after another.

The interviews were semi-structured with the same questions presented to all respondents (Opie, 2004). I used purposive sampling (Opie, 2004) for my learner interviews. The criteria for the selection of the learners to be interviewed was based on:

1. Classroom participation: while doing classroom observations I was able to see learners who were actively involved in the lesson, especially through contributions; hence with this criterion I could identify learners who would make a positive contribution to the study.
2. Clarity of speech in terms of audibility: Because some learners might be shy and not freely express themselves, which could affect the data capturing process, I needed a learner whose speech was audible and clear. This is important for transcribing the responses (Hatch, 2002).
3. A moderate understanding of mathematics: It had to be a learner who would possibly represent their school well. The candidate had to have been attentive in class most of the time.

During classroom observations I was able to identify such learners and made a special request to them to participate in the research interviews and they all agreed. In my next chapter I further explain how the analysis of interviews was done through pre-determined themes.

4.6.8 VALIDITY AND RELIABILITY OF THE DATA COLLECTED

The reliability of the data meant that I was able to collect the exact data that I set out to collect in terms of the aims and purposes of the study (Opie, 2004). A data collecting instrument is considered reliable if it measures/captures what it was supposed to measure/capture. Furthermore, according to Opie (2004), video recorded data can be easily accessed and verified. Sharon (2007) further explains that video recording makes it possible to replay and index the required scenarios for further investigations and reviewing at a later stage. In other words, the data will indeed be reliable if another researcher doing research in a similar field of study using the same instrument uncovers the similar aspects that I captured, that is, how language was used. At the same time, the data captured can be used in other research studies because it is electronic and readily retrievable.

I was also able to capture the unspoken scenarios upon which research conclusions could be drawn. Sharon (2007) points out that non-verbal communication can be used as part of data in a study. Furthermore, Opie (2004: 123) adds that “video-recording helps make sense of non-verbal activity.” This was important in my study because what learners do is more significant than what they say they do. Both the learners’ and educator’s body languages and facial expressions were captured.

4.7 CONCLUSION

I began my discussion by explaining the initial stages of my research in ensuring that proper preparations were followed. These included getting permission from the authorities as well as the school in which the research was to be conducted. I also explained the importance of observing ethical conditions by ensuring that all my respondents submitted consent forms for participating in the research. My research design section discussed the choice of the schools, the respondents and the data collection instruments for the study. The justifications and criteria for the main data collecting instrument, the video recorder, and how it was to be used during the research were elaborated on. I explained why this research was structured in such a way that it covered a period of 5 consecutive days especially in the main research school. It was also mentioned that because this research was a case study, the researcher was not going to make any changes to the classroom activities but present a case on the language usage. I concluded my discussion by looking at the actual research during video recording and that ethical considerations were adhered to, also ensuring that the data collecting instruments were reliable and gathered valid data. My following chapter would present a detailed analysis of all the data captured and interpreted.

Chapter Five

DATA ANALYSIS

5.1 INTRODUCTION

In this chapter I present an analysis of the data captured using the three data capturing instruments used in this study. I have analyzed the data from the three data capturing instruments and made comments and summaries of findings at the end of each data source.

The closed section of the questionnaire was analyzed for all the three schools in which data was captured. Data from each school were first analysed separately and then a composite analysis of the common trends that were observed in all the three schools was made. The closed section was analyzed through quantitative data analysis methods in which averages/mean scores were calculated using Excel software and hence the scores were linked to the range statements. The open ended section of the questionnaire was analyzed through the grouping all the responses according to the numbering in the questionnaire. I then counted the frequencies in which similar responses from different respondents per question were received. The quotations from these responses were captured for usage in the discussion chapter in which inferences and conclusions will be deliberated upon. Themes were used to group similar findings. These were attitude to African languages, English preference, and policy. The summary of findings is provided at the end of each data presentation section of the questionnaires.

The interviews were also analyzed in terms of predetermined themes. The inferences were drawn from each question asked. Major predetermined themes were used to classify the responses (Opie, 2004), for example, attitude to African languages, Preference for English, policy, etc. Finally, the classroom observations were analyzed following other predetermined themes such as code-switching and re-voicing. Inferences were drawn from these and conclusions were captured in the summary of findings or analysis section. Some of these findings are presented in tabular format. The lessons were all transcribed and labeled according to line/conversation numbers. The conversations containing the evidence of, for example, code-switching were extracted from the data transcripts of classroom observations and analyzed one at a time for all of the three major themes observed during classroom teaching.

5.2 DATA ANALYSING TOOLS

5.2.1 QUESTIONNAIRE ANALYSIS

In order to ensure validity and reliability, my questionnaire was divided into three parts. The first part explained the research and what was required from the respondents. The second part was in the form of a Lickert scale ranging from one to five and respondents had to tick next to the number of their choice from strongly agree to strongly disagree. Statistical methods were used to analyze the responses from the Lickert scale section through the use of an Excel software. The third part of the questionnaire comprised open ended questions in which respondents wrote their views on the questionnaire in the writing space provided. The open section was analyzed following predetermined themes. All the responses from the third (open) section were retyped and re-grouped following the numbering in the questionnaires for easier analysis. This means that all the responses for question number 1 were grouped together to view the common patterns under this question and to analyse the response according to the themes, and so forth.

A) THE CLOSED SECTION:

The closed section of my questionnaire which had about 10 questions was analyzed through quantitative methods of finding averages of the views expressed. The range of the Lickert scale was 1 to 5 from strongly disagree to strongly agree. Tallies were made from each questionnaire and scores were recorded in Excel software, which made it easier to find averages/mean using Excel formulae. The averages above 4 and less than 2 were crucial in making deductions. I realized that certain questions were asked differently and elicited similar responses.

The main themes and *findings from the closed section* were grouped in terms of the following headings:

1. Attitude towards African languages present in the classroom
2. Use of English for learning
3. Policy (LIEP) implementation

This was done mainly for the parents and the learners of all the 3 schools in which the research was conducted.

TABLE 1
LEARNER QUESTIONNAIRE
SCHOOL 1

LEARNERS' QUESTIONNAIRE ANALYSIS							
	1	2	3	4	5		
	Strongly Disagree	Disagree	Not sure	Agree	Strongly agree	Mean	
1. Mathematics is better understood in English than in any other language.	0	2	1	9	19	4	Agree
2. African languages are just as important as English is.	1	3	2	15	9	4	Agree
3. African languages are not useful in learning Mathematics.	5	1	14	10	3	3	Ns
4. Mathematics would be much easier if it was taught in my African language.	9	10	7	3	2	2	Disagree
5. Besides English, learners are also allowed to speak in any other language in class.	2	1	7	11	10	4	Agree
6. By not understanding English, a person will not understand Mathematics.	5	4	11	4	7	3	Ns
7. Parents are responsible for the schools their children attend.	1	3	2	8	18	4	Agree
8. The Constitution does allow for all languages to be treated equally.	0	2	6	10	12	4	Agree
9. The school language policy favors certain languages for teaching and learning.	2	1	8	12	6	3	Ns
10. Parents prefer their children to be taught in English.	0	0	1	14	16	4	Agree

Summary of the findings

The learners of School 1 feel strongly that Mathematics is easier in English than in any other language. They feel strongly that their parents prefer them to learn in English. This is the reason why they feel strongly that it was their parents who brought them to the Ex-Model C schools. They agree that the school language policy favors other languages. Moreover, they strongly agree with the constitution that all languages must be treated equally.

TABLE 2
SCHOOL 1
PARENTS

	PARENTS' QUESTIONNAIRE ANALYSIS							
		1	2	3	4	5		
		Strongly Disagree	Disagree	Not sure	Agree	Strongly agree	Mean	
1	Mathematics is better understood in English than in any other language.	1	1	1	5	26	4	Agree
2	African languages are just as important as English is.	0	1	4	11	20	4	Agree
3	African languages are not useful in learning Mathematics.	7	3	12	4	9	3	Ns
4	Mathematics would be much easier if it was taught in my African language.	4	11	11	7	2	3	Ns
5	Besides English, learners are also allowed to speak in any other language in class.	1	3	5	16	9	4	Agree
6	By not understanding English, a person will not understand Mathematics.	7	11	9	5	2	2	Disagree
7	Parents are responsible for the schools their children attend.	3	4	9	9	9	3	Ns
8	The Constitution does allow for all languages to be treated equally.	0	0	2	11	21	4	Agree
9	The school language policy favors certain languages for teaching and learning.	2	0	7	13	12	4	Agree
10	Parents prefer their children to be taught in English.	0	0	11	16	7	4	Agree

Summary of the findings

The parents of School 1 believe strongly that Mathematics is better understood in English than in any other language, while they disagree that by not understanding English a person will not understand Mathematics. Learners are allowed to speak other languages in class, though they agree that the school language policy favors other languages. Moreover, they strongly agree with the constitution that all languages must be treated equally.

TABLE 3
SCHOOL 2
LEARNERS

	LEARNERS' QUESTIONNAIRE ANALYSIS							
		1	2	3	4	5		
		Strongly Disagree	Disagree	Not sure	Agree	Strongly agree	mean	
1	Mathematics is better understood in English than in any other language.	0	0	1	2	8	5	Agree
2	African languages are just as important as English is.	0	2	3	2	4	4	Agree
3	African languages are not useful in learning Mathematics.	0	2	5	1	1	3	NS
4	Mathematics would be much easier if it was taught in my African language.	5	3	3	0	0	2	Disagree
5	Besides English, learners are also allowed to speak in any other language in class.	2	2	1	4	2	3	Ns
6	By not understanding English, a person will not understand Mathematics.	1	3	3	1	3	3	Ns
7	Parents are responsible for the schools their children attend.	0	0	0	4	7	5	Agree
8	The Constitution does allow for all languages to be treated equally.	2	0	2	3	4	4	Agree
9	The school language policy favors certain languages for teaching and learning.	0	0	5	4	2	4	Agree
10	Parents prefer their children to be taught in English.	0	0	1	3	7	5	Agree

Summary of the findings

Learners prefer English to learn Mathematics rather than African languages. They agree that they do use their African languages during Mathematics lessons. They are not sure as to whether their school language policy favors certain languages. The parents are responsible for sending them to the Ex-Model C Schools.

TABLE 4
SCHOOL 2
PARENTS

14	PARENTS QUESTIONNAIRE ANALYSIS							
		1	2	3	4	5		
		Strongly Disagree	Disagree	Not sure	Agree	Strongly agree	Mean	
1	Mathematics is better understood in English than in any other language.	0	0	0	3	11	5	Agree
2	African languages are just as important as English is.	0	1	1	6	6	4	Agree
3	African languages are not useful in learning Mathematics.	1	5	4	0	3	3	Ns
4	Mathematics would be much easier if it was taught in my African language.	3	7	3	1	0	2	Disagree
5	Besides English, learners are also allowed to speak in any other language in class.	1	4	2	5	2	3	Ns
6	By not understanding English, a person will not understand Mathematics.	4	5	3	2	0	2	Disagree
7	Parents are responsible for the schools their children attend.	1	2	4	4	2	3	Ns
8	The Constitution does allow for all languages to be treated equally.	0	0	1	3	10	5	Agree
9	The school language policy favors certain languages for teaching and learning.	0	0	3	6	5	4	Agree
10	Parents prefer their children to be taught in English.	1	2	2	8	1	3	Ns

Summary of the findings

Parents agree that Mathematics is better taught in English rather than in an African language which they feel though, is just as important as English. They disagree that by not understanding English one cannot understand Mathematics. They affirm that they are responsible for their children attending an Ex-Model C school. Finally they are sure that the language policy of the school favors certain languages.

TABLE 5
SCHOOL 3
LEARNERS

	LEARNERS' QUESTIONNAIRE ANALYSIS							
		1	2	3	4	5		
		Strongly Disagree	Disagree	Not sure	Agree	Strongly agree	Mean	
1	Mathematics is better understood in English than in any other language.	1	0	3	14	16	5	Agree
2	African languages are just as important as English is.	11	3	6	7	9	4	Agree
3	African languages are not useful in learning Mathematics.	5	2	15	7	1	3	Ns
4	Mathematics would be much easier if it was taught in my African language.	8	7	11	2	0	2	Disagree
5	Besides English, learners are also allowed to speak in any other language in class.	2	2	2	12	10	4	Agree
6	By not understanding English, a person will not understand Mathematics.	3	9	6	4	6	3	Ns
7	Parents are responsible for the schools their children attend.	1	0	1	8	18	4	Agree
8	The Constitution does allow for all languages to be treated equally.	3	1	8	8	9	4	Agree
9	The school language policy favors certain languages for teaching and learning.	3	1	11	8	6	3	Ns
10	Parents prefer their children to be taught in English.	0	1	3	6	19	4	Agree

Summary of the findings

Learners felt that English is the preferred language for teaching Mathematics other than African languages. They are, however, allowed to speak their languages during their Mathematics lessons. The learners disagree that by not understanding English one will not understand Mathematics. Their parents are responsible for sending them to the Ex-Model C School that they attend. They are not sure if the language policy favors certain languages or not.

TABLE 6
SCHOOL 3
PARENTS

31	PARENTS' QUESTIONNAIRE ANALYSIS			TOWNVIEW HIGH SCHOOL				
		1	2	3	4	5		
		Strongly Disagree	Disagree	Not sure	Agree	Strongly agree	Mean	
1	Mathematics is better understood in English than in any other language.	0	0	1	6	22	4	Agree
2	African languages are just as important as English is.	0	0	1	12	17	4	Agree
3	African languages are not useful in learning Mathematics.	8	4	12	3	4	3	Ns
4	4. Mathematics would be much easier if it was taught in my African language.	7	5	13	4	1	2	Disagree
5	Besides English, learners are also allowed to speak in any other language in class.	1	2	9	8	11	4	Agree
6	By not understanding English, a person will not understand Mathematics.	6	11	4	3	7	3	Ns
7	Parents are responsible for the schools their children attend.	6	5	8	5	9	3	Ns
8	The Constitution does allow for all languages to be treated equally.	1	2	0	11	16	4	Agree
9	The school language policy favors certain languages for teaching and learning.	0	4	4	9	13	4	Agree
10	Parents prefer their children to be taught in English.	0	4	8	6	11	4	Agree

Summary of the findings

English is the preferred language for teaching Mathematics, not African languages. Parents are that their children are allowed to speak their vernacular languages during their Mathematics lessons. The parents disagree that by not understanding English one will not understand Mathematics. Parents are responsible for choosing the Ex-Model C School that their children attend. They are sure that the language policy favors certain languages.

COMMON VIEWS AND TRENDS FROM THE 3 SCHOOLS

The learners felt that African languages are important but cannot be used for the teaching of Mathematics. It is further deduced that most learners preferred to learn Mathematics in English. In all the three schools, learners were allowed to speak their different African languages during their Mathematics lessons. Learners were convinced that it was their parents who chose to send them to Ex-model C Schools. All the learners understood that the constitution of South Africa allowed for all languages to be spoken equally although they felt that their school language policies favored other languages.

The parents also felt that African languages are important but cannot be used for the teaching of Mathematics. They also preferred their children to learn Mathematics in English. However, parents felt that even though one is unable to speak English, this does not mean one cannot do Mathematics successfully. In all the three schools, as far as the parents knew, their children were allowed to speak their different African languages during their Mathematics lessons without any problems. Parents agreed that they were responsible for sending their children to Ex-model C Schools. The parents also understood that the constitution of South Africa allowed for all languages to be spoken equally even though they felt that their children's school language policy favored other languages.

B) THE OPEN SECTION:

The questionnaire's open section was analyzed by capturing the responses of all the responses, that is grouping of questions/responses from one to ten. By grouping responses of the same questions it was easier to locate the common views expressed and the number of respondents with such common views. These actual views were captured as written in the questionnaire and retyped. Inferences and conclusions were to be drawn based from the themes that had been pre-determined. These themes included code switching and re-voicing. Please see Table 11 for other supporting themes.

TABLE 7**OPEN SECTION ANALYSIS OF QUESTIONNAIRE****LEARNERS' VIEWS****SCHOOL 1:** Total number of learners in class = 33

Number of responses = 33

Questions	Responses – those in brackets are the respondents who made the statement/choice.	Analysis
1. List the languages that you can understand and speak.	English (27), Afrikaans (9), Sotho(6), Venda(1) , Tsonga(1), Setswana(27), Sepedi(3) , Xhosa(8) , Swati(1), Zulu (13) and Ndebele(1).	In the data that is presented it becomes clear that there are language differences in this Ex-Model C class, and in fact all the eleven official languages are represented. All 27 learners understand English and Setswana as well other African languages.
3. Which language is most spoken in your classroom?	English (23) Setswana (13) Zulu (1)	English is seen as the most dominant language spoken during teaching and learning as well as during normal conversations when learners talk to themselves.
5. Which language would you prefer when solving Mathematics questions in a test?	English (33) Setswana (2)	English is the most preferred language for the learning and solving of Mathematics problems during assessments at the school. It is interesting that 2 learners prefer Setswana to be used for answering Mathematics questions in a test.
7. Are you able to freely express	Yes (15) = in cases where	The majority of the learners (15)

yourself in your vernacular during your Maths lessons, especially when you do not understand? Explain.	they cannot express themselves in English (7) =Talking to the educator (4) No (7) = English is easy (5)	speak their vernacular during Maths lessons when they do not understand English, and some do so when talking to the teacher. It is interesting to note that 7 learners do not seem to speak African languages at all, in preferring English. This view tallies with the results from the open section of the questionnaire in which both the parents and the learners agreed that learners are not forbidden to speak their African languages during their Mathematics classes. What is also of significance is the fact that doing so is helpful to their understanding of Mathematics since in the open section parents felt that by not understanding English it does not mean one cannot understand Mathematics.
8. A friend of yours struggles to understand the English language in a Mathematics problem. Explain what you could do to assist?	Explain in her language (26). 26/33 {<i>language is seen as a barrier to solving Mathematics problems</i>}	The majority of the learners (26) admit that switching to another language is a possible solution to the lack of understanding.
9. Would you be comfortable if in your class your Mathematics teacher explains the Mathematics problem in English and in your vernacular as well?	“Yes” (15) = comfortable, in order to assist the understanding of Mathematic (6). =No supporting reason (8) “No” (5) = might not help, but only confuse (3)	Most learners (15/27) are comfortable with <i>switching of languages</i> to help understand Mathematics better. While still a few (5) do not feel that this might help.

Summary of the findings

1. The eleven official languages were present at school.
2. There was a dominance of and preference for English.
3. There was a preference for learning Mathematics and doing assessments in English.
5. Generally, English was preferred.
7. Learners were allowed to use African languages during Mathematics classes.
8. There was a feeling that mathematical problems could be solved using another language other than English.
9. Learners were generally comfortable with code switching.

TABLE 8

PARENTS' VIEWS – SCHOOL 1

Open-ended questions: Total number of parents given = 33

Number of responses = 33

Questions	Responses	Analysis
1. List the languages that you can understand and speak.	English(29) Afrikaans (13) Sotho (5) Setswana (19) Xhosa (5) Sepedi (2) Venda(2), Ndebele(2) Zulu (6)	Most (29) parents understand English. However, Setswana is the most dominant African language spoken by the parents.
3. Do all the languages enjoy equal status in your child's class? Why?	“No”(15) = because the language of teaching and learning is English alone, and to accommodate others only English is used. (7) = no reason (7) “yes” (9) = communicate with each other(4) =there are different languages (2)	The majority (15) of the parents feel that not all languages enjoy equal status and the most common reason they gave is that English is used frequently for learning and teaching, as this accommodates all learners.
4. Which language would you	English (32) Tshivenda (1)	Most of the parents prefer English

prefer your child to learn Mathematics in at school?		for teaching and learning of Mathematics.
7. Would you allow your child to learn Mathematics in his/her mother tongue if given an opportunity to do so? Why?	“No” (22) = It is an English school (1) = English is better, easier, because other children might not understand (8) = the mathematics better in English, challenges for future, tertiary education (3) “Yes” (7) = (3) no reason = they will understand better (2) =All languages are equal (1)	The majority of the parents would not prefer mother tongue for teaching Mathematics at the school. However,7 parents would allow their learners to learn mathematics in their mother tongue if given a chance.
10. Would you be comfortable if in your child’s Mathematics classroom the teacher explains the Mathematics problem in English and in your child’s mother tongue as well? Why?	“Yes” (16) = due to low proficiency in English, it will assist with understanding. “No” (6) = teachers might need more time(1), =she might not even know other languages(1) =prefers English only (2)	Parents would be fine with code switching in order to assist learners learn Mathematics better.

Summary of the findings

1. All understand English
3. Parents were aware of language discrimination.
4. Parents preferred English as the medium of instruction.
7. Parents were not keen to have their children learn in their home languages.
10. Parents accepted code switching due to learners’ low proficiency in English.

5.2.2 INTERVIEWS – THE 3 LEARNERS AND THE TEACHER FROM SCHOOL 1:

In this section of data analysis the interviews were transcribed and the responses of the three learners were presented side by side in a tabular format in order to highlight the common patterns and findings. I noted my deductions in the last column per question as seen in Table 9 below, and other findings were written at the end of this table:

TABLE 9

The analysis of learners' (3) interview from School 1:

Questions	L1 - response	L2 - response	L3 - response	Analysis
1. Do you think all the languages enjoy equal status in your classroom? Why?	1. Yah I think so. It's the same because in any language is gonna do with this they still going to understand this ..err.. they 're still going to get the point of the thing that the teacher is trying to explain. They gonna do like	1. Yes sir I think so. (<i>why</i>) Sir sometimes according to the class I do not understand where the teacher explains in English so he or she will ask a friend to at least explain in some other language for him or to understand better.	1. OK what I 've noticed is that although it's an Afrikaans school, and we are supposed to speak English in our classes, most of the kids speak in like African Languages nobody care about them that much	During interviews, learners stated that all languages are treated equally in their classes even though English seems to be dominant. While at the same time the use of other languages was not forbidden by the teacher.
2. Are you able to freely express yourself in your vernacular during your Mathematics lessons? Explain.	2. Definitely no! I can't. (explain). Because of the... they way....like the numbers, like, ungwe, pedi, tharu, I wouldn't, I don't know, I	No, sir. For me it's hard, cause I never spoke vernacular so when it comes to say...like, I cannot say in a different way. It's not what I, it's not my own	Yah I do, our teacher is OK with it. There is no problem with it.	Learners have become more accustomed to the use of English and in fact have forgotten how to say certain words in their vernaculars.

	wouldn't go up to ten. That is to say I wouldn't go up to twenty seven, twenty eight,... I wouldn't be able to do that in my language.	doing that.		<i>Though from the questionnaires, learners were fine with using other languages (African in this case) if they could not understand English, but the evidence from the interviews reveals the opposite. This is particularly due to the lack of registers from the African languages needed to do Mathematics and the translation from one language to the other.</i>
3. When do you use your mother tongue in your Mathematics class?	C1. If I can...If I am helping another person If I can see that they do not know or they do not understand properly in English, then I 'll try and explain in another language.	I use it when, maybe a lot of times I use it when I speak to someone who doesn't understand English. But other than that we love talking in English.	C1. Uhm. Ok I use it when I am tired of speaking English. Cause sometimes I do get tired when everybody is speaking Tswana, and I am like it's OK now I am going to speak Tswana.	African languages were helpful to explain to learners who were not completely conversant with English.

4. Are you aware that the South African constitutions allows for the equal use of all languages?	No I wasn't aware of it.	C2. I wasn't aware. I thought that maybe all children understand English...so...so what... I thought that. To me it seems like English for a lot of children outside there if you call him or her and you talk to him or her in English he or she will understand.	C2. Oh, I honestly didn't know that. I didn't know. I just think we are supposed to speak English because it's an English school.	Learners were not aware of what informs certain language practices at their school.
5. Is this stipulated in the language policy of the school? Have you been made aware by the SGB?	D2. No	D2 No. Wow! (very much surprised) I never, I never checked something like this.	D2. Uhm I'd say no. Because it's an Afrikaans and English school. Not really. But I think that it's something that we all know.	<i>The language policy of the school has not been clearly understood by the learners or brought to their attention. In spite of the presence of other languages in these schools it seems that their language policy has not changed to accommodate the majority of the learners who speak African/other languages.</i>
6. Would you be	<u>Yah. I will be</u>	No. no. (why,	No. I prefer the	Even though one

comfortable if in your class your Mathematics teacher explains a Mathematics problem in English and in your vernacular as well?	<u>comfortable.</u> <u>Sometimes</u> <u>there're some</u> <u>things that in</u> <u>English you won't</u> <u>get as much as in</u> <u>your vernacular</u> <u>language.</u> So, I would rather sometimes have them to ... the numbers I would like them in English but the explanation in the mother language.	explain) Sir if a teacher explains in Maths. I would like her, him or her to explain in a particular way in English, but in others, cause sometimes, when somebody starts, especially when the teachers speaks vernacular, some other children are going to take as if, ok now, she is saying this and then we can all say it. And then it's gonna be a ...trouble.	teacher does it in English because it's going to confuse us if she is switching languages all the time. Because it's only easier when you speak one language. Then you could get more, that is what I think.	learner would not mind to do mathematics in an African language he expressed a difficulty of having to say numbers in such a language. The other two learners clearly preferred English because they thought it is easier and avoids any possible confusion. Hence consistency in using one language is viewed as more beneficial than switching languages.
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Summary of the findings from learners:

1. Learners thought that all languages enjoy equal status, because English is mostly used for all to understand.
2. Some learners were not able to express themselves in their vernacular because of some vernacular words whose English equivalents they did not know.
3. Learners said they would use vernacular when talking/explaining to a person who does not understand English.
4. Learners were not aware that the constitution allows for the equal use of all languages.
5. Learners felt that their parents were happy with English as the language of learning and teaching.
6. Learners were not aware of the language policy of the school.
7. They did not prefer code switching when learning Mathematics.

TABLE 10**Analysis of Teacher Interview from School 1:**

Questions	Responses	Analysis
1. What is your main language?	1.a. I don't understand when you say main language. My mother tongue is Setswana. But where I am working <u>the medium of instruction is English and Afrikaans</u> ... I am doing all my classes in English.	The educator fully understands the <u>language policy of the school</u> and <u>is aware</u> that at this school only English and Afrikaans could be used for learning and teaching.
2. Which language do you use as your medium of instruction?	<u>English</u>	The educator <u>prefers to teach in English</u> even though it is not her mother language regardless of the majority of the learners she teaches being also ESL speakers, of which the majority speak and understand her mother language, Setswana.
3. Do all the languages enjoy equal status in your classroom? Why?	d. I think they do all enjoy, more especially when using English. Because I think <i>English is the simplest language whereby all learners understand</i> . It's the only easiest language. (<i>Are you saying that because the learners can also say in their own languages?</i>) They can talk in their own language but it's difficult. I'm a Setswana speaking person, but it will be <u>very difficult to teach Maths in my</u>	It is clearly evident that the educator <u>prefers the use of English for teaching Mathematics</u> . This is captured in her assertions that " <i>It is the only easiest language.</i> "

	<u>own language because even to myself it is very tough.</u> Because even if you go to the schools whereby they are using Setswana or Xhosa or whatever, as a medium of instruction, but when it comes to Maths they always use English.	
4. In your opinion is this policy in line with the Language-in-School Policy? Please elaborate.	f.2. I think... yes it is. Because most of the, <u>we are not speaking the same language here, there are the Xhosas, the Zulus and whatever.</u> And the only language that I understand up to this point is Afrikaans, English and Setswana. Because I am using English, which is the medium of instruction that is why even <u>the Xhosas, the Zulus, and whatever, those doesn't know Setswana can understand.</u>	As expressed in the questionnaires that <u>English is the preferred solution to language diversity,</u> a similar view is witnessed in this response by the educator. Furthermore, the challenges that this teacher would experience when trying to switch languages is that <u>there are too many other languages.</u>
5. Would you say that the parents are happy with this language as the language of learning and teaching?	I think they're happy. <u>I think they are happy.</u> Because they.... according to my own opinion I am a parent too, because I understand English, <u>I work with the kids from different languages but only to find that I have seen that even though they are using different mother tongues but when it comes to English they always, they all understand.</u> That is why I am saying maybe even the parents are	The educator highlights the <u>parents' expectations for their children to learn in English since teaching them in other languages could pose conflict of interests for their children.</u> Once again the educator does not forbid (cannot stop) learners from using their African languages. <u>They seem to have accepted though that learning and teaching of Mathematics occurs only in</u>

	happy because <u>I didn't have a problem whereby we are having a problems whereby the (teachers) parents were saying please this kid of mine is not using English at home why are you preferring to teach her in English, why can't you teach her in a mother tongue.</u> Yes they are happy.	<u>English.</u>
6. Would you be comfortable in your class to explain the Mathematics concepts or problems in English and in the majority African language spoken by your class? Why, or why not?	g. <i>I won't be comfortable. Because I may start with my mother language, its Setswana, it's tough, is very tough. Even myself won't be able to express everything in Setswana because some of the words we are having the Tswana name for them but we just call them in English,</i> more especially when it comes to the numbers. When, OK let me count for you from number one up to number five, in English it's one, two three, four, five. Even if you can go to the young lady, the baby who is five years old will count to you, she will say one, two, three, four, five, but when it comes to the mother tongue, Setswana, it's ungwe, pedi, tharu, nne, tlhanu. Even when I am at home, I am speaking Tswana at home, but if I want somebody to go to the shop to buy the oranges I need five of	The educator <u>is of the firm opinion that switching language codes and using all other languages will not be possible.</u> The shortage of registers is also a serious challenge when teaching in African languages. <u>The dominant use of English is seemingly irreversible since even the children from an early age start counting in English than in their mother tongue,</u> and counting in their mother tongue is very difficult when compared to English.

	them I'll never say to him go and buy dinaume dilithlanu I always say tsamaya u reke dinamune dili five.	
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Summary of the findings

1. The teacher's first language is Setswana
2. She prefers to teach in English
3. English is the most dominant language in the classroom
4. Using English is seen as abiding by LiEP, stipulations because English is easy for most learners.
5. The teacher feels that parents are happy with English as the Lolt of the school.
6. The teacher is not comfortable with code switching, as she might not even know her own language and those of learners due to the lack of mathematical registers.

5.2.3 THE ANALYSIS OF THE CLASSROOM OBSERVATIONS

The research questions, which guided my analysis, are: Which are the dominant languages that exist in the former model C schools? How are these languages used or not used to facilitate the teaching and learning of Mathematics? More evidence and answers for my research questions will be revealed in this part of the analysis. For example, evidence of code-switching using African languages, re-voicing and the use of artifacts as teaching strategies developed to deal with the challenges of language. In the following section of my analysis I describe the methods undertaken during the analysis of classroom observations.

A) TRANSCRIPTIONS

I transcribed two lessons from School 1, which were about 30 minutes each, in order to analyze and classify the conversations according to the pre-determined themes. I typed out every word that was uttered by both the teacher and the learners. Pseudonyms were used, such as: *Learner 1*, *Learner 2*, *Learner*, *Teacher*, *“Tom”*, etc., to ensure anonymity. The transcript provided me with more evidence of the actual instances and the manner in which the use of languages took place. I also labeled each line of conversation for reference purposes for the entire transcript of classroom observations.

B) IDENTIFICATION OF THEMES

The analysis was done according to predetermined themes. I used colors on the transcripts to record the themes so that I have a clear picture of how many times a particular theme appeared. I also did the same on my typed transcript on the computer and colored the themes with different colors: Re-voicing was in blue, Code-switching was red, and the use of Artifact was gray. What was also most important was why a particular theme occurred. The following were part of the criteria for analysis:

- i) instances of usage of more than one language – code-switching
- ii) the teacher’s body language, examples, contexts – the use of artifacts
- iii) re-voicing – repetition (patterns), as a teaching method developed to cope with the diversity.

In the extracts as seen in Table 11, the identification of themes has been entered in the last column including some narrative summaries. I have done the analysis per theme, as a separate heading, after these were identified from the transcripts using the supportive themes as a lead. All the conversations that contained code-switching, re-voicing, use of artifacts were extracted from the main transcript or lessons and analyzed separately.

C) PATTERN FINDING

While analyzing the transcripts, I was searching for the evidence of the usage of other languages as well as how and why these were being used. Hence patterns of code-switching instances, re-voicing, repetition, etc., were noted and labeled according to the line numbers. Initially I had written down more themes, but due to the appearance of only a few themes, I decided to just focus my research on those themes that were evident. These were sufficient to provide the necessary answers to my research questions. Patterns were counted and used for further analysis and discussions as would be seen in the discussion chapter.

D) NARRATIVE SUMMARIES OF THE FINDINGS:

As seen in the analysis of the interviews above, hand written notes for the themes were roughly done on the transcripts. Some of the narrative summaries were noted on the transcript on which I wrote what the video showed. For example: “*the teacher walked from group to group to assist learners*”. (*Narrative summaries appear in Italics.*) By writing narrative summaries, of how events unfolded and which themes were evident, it was easier to find the patterns and even to discuss and triangulate my data for all the three data collecting instruments used.

E) SUITABLE QUOTES WHICH SUMMARIZED MY FINDINGS

Based on the dominant themes, the patterns identified in each theme, including other data sources, e.g. questionnaires and interviews, certain utterances and statements from responses were noted or highlighted in order to be used as supporting evidence in the discussion chapter. Some data statements were contradictory, e.g. interviews revealed

that learners did not like code-switching, while questionnaires showed the opposite. This is probably due to the number of learners selected for the interviews. It is possible that the number (3) of the interviewed learners was not fully representative of the class sample and hence limited. The quotations were directly from lesson questionnaires, interviews and transcripts. Please (refer to Annexure A and B), to be used as evidence of language dynamics.

Table 11

EXPLICIT ANALYSIS

The following table explains the three main themes that were used to analyze the classroom observation transcripts (refer to Annexure A and B). Within the main themes, I have included and explained the sub-themes as well. Hence the following table is the analysis of the classroom observations:

<u>CATEGORY</u>	<u>INDICATORS</u>	<u>DEFINITION</u>
1. CODE-SWITCHING	Code-mixing	Code-mixing refers to any admixture of linguistic elements of two or more languages. Some languages are more dominant, through their frequent use and availability of Mathematics registers, such as English, and hence other languages adopt most of their words.
	Code borrowing	It is when a sentence uses words that are taken from other languages but are used as though they are natural words of the language. For, example, the word “penseli” is an English word but it has been used as if it is a normal Zulu word.
2. REVOICING	Interpretation	Explaining the same concept but using

		different words, to ensure that if there was a word or phrase that learners did not understand, a simpler and more understandable term is used.
	Translation	A translation as used in this research would take a form of using another language to express the same concept. This will be evident when, should a learner not understand the English explanation, an alternative one perhaps in Setswana could be used.
	Re-explanation	To explain the same concept but in similar words, to ensure that even those learners who might not ask questions if they do not understand get a second, third or even fourth chance to access the Mathematics being discussed.
	Repetition	The repeating of a word, phrase or sentence by one, two or many individuals in order to affirm common understanding and achieve a common goal. A teacher may repeat to the class in order to ensure they are following his/her instructions. Learners might repeat after a teacher and vice versa.
5. USE OF ARTIFACTS/ GESTURES	Body language	This is silent communication that results in a required behavior without the utterance of a word. It involves the use of hand signals, pointing and illustrating, facial expressions, or even demonstration.
	Artifacts	The use of a familiar, or more contextualised setting in order to explain a more difficult, abstract and complicated mathematical

		scenario. It might involve using objects, experiments, etc.
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TABLE 12

CLASSROOM OBSERVATIONS

LESSON 1 - this was actually the third lesson observed and video taped, I have labeled it as lesson 1.

Transcript extracts / instances of Re-voicing. Re-voicing occurred 7 times in 20 lines out of 70 lines in total = 29% as observed in lesson 1

THEMES		
A. Re-voicing,	Transcript extracts / instances	Common observed patterns/Analysis (numbers in brackets represent counters of similar events)
Lesson 1	{8} Learner 2 : (<i>continues to read</i>) ... if one week refers to seven day, and { one.....	{8}Narrative summary
<i>Instances</i>		Learners answer,
(1)	{9} Teacher : seven days ----- {11} Teacher : What is the question please.....? 1.1.1 {12} Learner : Making tea... {13} Teacher : How much water is used to make tea once..? -----	{8 – 9} The teacher repeats with a correction in “days”, adding the “s” Learners answer, {12- 13} The teacher repeats “make tea” by making a complete acceptable English sentence.
(2)		

(3) (4)	{37} Teacher : R288. (<i>learners talk in Setswana, mocking the one who gave the wrong answer</i>) Therefore the first question is saying you are using 1, 2 kilos of water how many times a day? {38} One learner : 3 times {39} Teacher : 3 times a day. How many times per month? {40} Another learner: 3 times {17} Teacher: Therefore how many days do you come to school? (<i>she writes the responses on the board</i>) : $5 \times 4 = 20$. {18} All learners : 20 days! {19} Teacher : Is it 20? {20} All learners : Yes! {21} Teacher : It's 20. Therefore if.... {26} All learners : 20 {27} Teacher : It's 20. Therefore, which means how much am I going to pay? This amount....(<i>pointing to the answer of : $14 \times 5 \times 20 =$ _____</i>). This one is the one that I am paying per day. (<i>Pointing towards the answer</i>). How many days per week?	{37} Narrative summary Learners answer, {38-39} The teacher repeats by adding “a day” Narrative summary – evidence of demonstrating Learners answer, “20 days” The teacher repeats answer “20”, by asking and to probe further in order to build learners’ confidence in the answer Teacher finally affirms their reasoning by repeating “20” Learners answer, “20” {21} {27} The teacher repeats “20” with an interpretation and using “I” : personalizes the question to put it in proper real life context.
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(5)	{36} All learners : R288. {37} Teacher : R288. (<i>learners talk in Setswana.....</i>) ----- {57} Teacher : Twice per week <i>a kere</i>? Therefore it's going to be 50 times... {58} All learners : 2 {59} Teacher : Is it times two? -----	Narrative summary {further probing and questioning} {36} Learners answer, "288" {37} The teacher repeats "288" {58-59}Learners answer, "2" The teacher repeats by probing further their answer of "2"
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Lesson 3	Transcript: <i>Re-voicing as “teaching patterns” occurred 6 times as a teaching method.</i> <i>Re-voicing occurred 31 instances of re-voicing of 44 lines out of 100 lines in lesson 3 = 44 %</i>	Common observed patterns/Analysis
	{5} Teacher : What is the meaning of this song, because there is a saying that says: “ action speaks louder than words,” can anyone read the first question for us? {6} Learner 2: (<i>begins to read</i>) {7} Teacher: Listen, listen, listen, listen..... Yes Steven... {8} Learner 2 : (<i>continues to read</i>) ... if one week refers to seven day, and one..... {9} Teacher : seven days {10} Learner 2 : and one month refers to 30 days, determine the estimated monthly water consumption for..... {11} Teacher : What is the question please.....? 1.1.1 {12} Learner: Making tea... {13} Teacher : How much water is used to make tea once..? {14} Some learners : 1. 2 ----- {15-6} Teacher:How many times do you come to school in this 30 days? It’s going to be 5... how many days are there in a	Patterns Narrative summary {7} Repetition (1) {8} – {9} Repetition (2) {10} Interpretation : 30 days = month (3) {12} - {13} Repetition “making tea” (4) {17} Translation of 5 X 4 (5) {17} – {19} Repetition of “20”

	week? {16} All learners : 7/4 {17} Teacher : Therefore how many days do you come to school? (she writes the responses on the board) : $5 \times 4 = 20$. {18} All learners : 20 days! {19} Teacher : Is it 20? {20} All learners : Yes! {21} Teacher : It's 20. Therefore if you want to know how much are you going to be paying per month, you are going to say: you know that I am paying R 14 per day. What about per week? How many weeks? {22} All learners : 4 {23} Teacher : I am paying R14 per day. How many days am I coming to work per month? {24} All learners : 5 days {25} Teacher : Per month {26} All learners : 20 {27} Teacher : It's 20. Therefore, which means how much am I going to pay? This amount....<i>(pointing to the answer of: 14×5</i>	(6) {18 – 21} Teaching Strategy Pattern (A) The pronoun “you” requires the learners to personalize the situation as if they are involved – real life context. {21} Interpretation (7) {21} Repetition “week/s’ (8) {23} Contextualizing to relate to real life familiar contexts by using “I” Interpretation of (5X4) “5 working days times 4 weeks” (9)
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	X 20 = _____). This one is the one that I am paying per day. (<i>pointing towards the answer</i>). How many days per week? {28} All learners : 5 ----- {36} All learners : R288. {37} Teacher : R288. (<i>learners talk in Setswana, mocking the one who gave the wrong answer</i>) Therefore the first question is saying you are using 1, 2 kilos of water how many times a day? {38} One learner : 3 times {39} Teacher : 3 times a day. How many times per month? {40} Another learner : 3 times ----- {52} All learners : Eleven times {53} Teacher : per month? {54} All learners : 30	{26} – {27} Pattern B {26} – {27} Repetition of the answer “20” (10) Emulating by showing and demonstrating – artifacts/body language. (11) {36} – {37} Repetition of “R288” {36} – {37} Interpretation: the use the word “therefore” implied application of what has been realized. (12) {36} – {37} Pattern (C) {38} – {40} Repetition of “3 times” (13) {38} – {39} Pattern (D) {53}- {54} Interpretation/translation (14) {56} – {57} Repetition
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	{55} Teacher : washing clothes? {56} All learners : twice per week {57} Teacher : Twice per week <i>a kere</i>? Therefore it's going to be 50 times... {58} All learners : 2 {59} Teacher : Is it times two? How many weeks are there in a month, are they two? {60} All learners : Oh 4 Teacher : Go on with your work please, let's give you 5 minutes to complete that work, then we'll report to question 1.2. Please! Make sure that you show all the calculations! Look at this one. <i>(pointing to the board where she had written to illustrate).</i> ----- {63} Teacher : Ok! Attention, attention... let me get the question in 1.1 Activity one. <i>(she reads the question)</i> “ If one week refers to 7 days.....” What will be the units for the answers that you are going to get? From 1.1.1 up to 1.1.5? What will be the units? Boitumelo? -----	of “twice per week” (15) Repetition in order to coax the learners to agree: “akere” = “isn't it?” (16) {56} – {57} Teaching Pattern (E) {58} – {59} Repetition of “two, in order to probe further (17) {58} – {59} Pattern (F) Demonstrating – Narrative Summary (NS0 {63} Repetition of the question “what will be the units” (18) NS {63} Repetition (20)
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	{67} All learners : 4 {68} Teacher : Therefore it means you are not going to say 30 days is going to be 4 weeks, because you are washing per week in a month, please, sharp-sharp, sharp-sharp ...then say thank you to me, say thank you... can we move on to 2.2. you are wasting time,.... Sorry...you are wasting time,....please you can't waste time {69} Teacher: Attention, we need to get the information so that we cannot stop writing. Attention, 2.2 let us read the question and then we go back to 2.1, let's read the question in 2.2, anyone who can read the question for us? Bongani, can you please read the question for us? {70} Learner : Efing? ----- {71} Teacher : Show by calculation that Mr Molaka's family will be using more water than free 600 l of water given per one, to cover the basic needs.....listen carefully... ok for 1.2 you are going to add all the litres of water that you have been calculating so that you can get the amount of water that has been used per month. For 1.2, in 1.1 you have been calculating how many litres must you use for making the tea, how many litres you have been using for washing, how many litres ...what else, for cooking, for bathing, for flashing. Therefore 1.2 says, show by calculating how much water is he going to use. How are you going to answer that question? By adding all the total of waters that are there. Add everything that is there. So that you can get	{68} Interpretation – 30 days = 4 weeks (21) {69} Repetition of instruction to drill procedural thinking according to what question demands. “read the question” (22) {71} Interpretation/translation “you are going to.... (23) {71} Repetition of “how many litres” and “adding” (24)
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	the answer for 1.2. {75} Teacher : If you don't know what the difference is please there are no keys there it's open, the toilets.... 1.3 will the difference between 6000 and the answer that you got in 1.2. 1.2 sum of all the answers that you got in 1.1. {78} Teacher : Ok in 1.4, the answer that you got in 1.3 must be converted to kilolitres. I am talking about.... "Learner", ke mang...? I 'm talking about 1.4 not 1.3, please. Ok, attention 1.4 what does the question say? Please don't just go straight to the answers make sure that you read the questions before you start answering. 1.4 how much Mr, Mrs Moabelo's family pay for the excess water consumed in that month in 1 kilolitre cost if one kilolitre cost R3,40c. What will be the unit for 1.4? Stop writing. What will be the unit for 1.3, I mean 1.4? If you think you know the answer or if you want to try, just raise up your hand! Read question 1.4. Read question 1.4! What will be the unit for 1.4? We are going to hear Lerato..... {89} Teacher : Ok 1.3 you all can answer there... (pointing to the board) in 1.3. The first step in 1.4, you take the answer that	{75} Repetition "the difference" (25) {78} re-explanation (26) {78} Repetition of the question to drill procedural thinking according to what the question demands (27) {78} Repetition of two phrases "read the question" (28) "What will be the unit for..." (29) "what does the question say.....?" (30) {89} interpretation/translation
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	is there in 1.3 convert it into kilolitres then you get there..(pointing to the step already done/written on the board)... multiply by 3,40 divide by kilolitre , the answer is there.. and for 1.4 they are saying answer rounded off into two decimal places, (talking directly to a learner) ... the question is there in a question paper is not there (point at her face/eyes). 1.4 answer rounded off to two decimal places. Why are they rounding the answer into two decimal places? Because you know that when you are dealing with money... because you know that when you are dealing with money you must always have two digits after a comma. So when you are rounding off to two digits, you look at the third number, if the third number is more than 5 you make it one adding to the second number after the comma, if the third number is lesser than 5 you make it zero add it to the second number after the comma, sharp.. sharp, then you can go on with your work. <i>(putting the workbook on the table)</i>	rounding off to 2dpl (31 NS (Narrative Summary)

A. Code-switching	Transcript	Analysis
	<i>Code switching Occurred 6 times in 6 lines out of 100 lines = 6%, refer to Annexure B, in lesson 3.</i>	

Lesson 3 (1)	{1} Teacher : (<i>Hands out learners' workbooks, calling each learner by name to come and collect from the front. One learner decides to take for others sitting at the back, and the teacher spoke in Setswana trying to stop her and she responded in Tswana that she did this for those sitting at the far back of the class...</i> “ ... ke tla ditlisa ko morago....”	{1} – {2}Code switching in order to gain classroom management {1} NS {1} Code switching in order to stress attentiveness and hence resulting in correcting that which was wrong.
-learner excl.	{2} Teacher: (reprimanding a learner in the front group in Tswana, speaking in a low voice) “Bona...”	{2} Code switching in order to reveal a fault “Bona...” = “see here....”
(2)	{47} Teacher : 30 times, that’s what you will calculate the amount of water that you are going to use for tea it is going to be 1, 2 times...? {48} Learner: times seven (<i>utters an incorrect answer</i>) {49} Teacher : it’s sleepy (<i>speaking in another language</i>) “...nna ke go buleletsi...” Is it times 7? ... cause you are using it three times a day! {55} Teacher : washing clothes? {56} All learners : twice per week	48} NS (Narrative Summary) {49} NS “..nna ke go buleletsi” = “I told you so”. Done in order to bring further awareness to a fact

(3)	{57} Teacher : Twice per week a ke re? Therefore it's going to be 50 times... {58} All learners : 2 {59} Teacher : Is it times two? ----- {69} Teacher: Attention, we need to get the information so that we cannot stop writing. Attention, 2.2 let us read the question and then we go back to 2.1, let's read the question in 2.2, anyone who can read the question for us? Learner, can you please read the question for us?	and to cause re-consideration. {57} Code switching in order to coax the learners to agree: "a ke re" = "is'n it?". Learners will agree even if they don't know.
(4)	{70} Learner: Efing? {71} Teacher : Show by calculation that Mr Molaka's family will be using more water than free 600 l of water given per one, to cover the basic needs..... ----- {76} Teacher : Learner where are you going? (talking to another learner this time) Have you done 1.3? Learner have you done 1.3. {77} Steven : Yes! {78} Teacher : Ok in 1.4, the answer that you got in 1.3 must be converted to kilolitres. I am talking about....	{70} Code switching in order to gain clarity as the learner sought for help – none was given though: "Efing?" = "which one?" {78} Code switching in

(5)	Learner, ke mang...? I ‘m talking about 1.4 not 1.3, please. Ok, attention 1.4 what does the question say? Please don’t just go straight to the answers make sure that you read the questions.	order to release frustration and maintain discipline. Spontaneous speaking in Setswana exposed the teacher to the fact that her main language in fact is Setswana and teaching in English all the time was a bit uncomfortable at times and even frustrating as she was overwhelmed by a moment of anger when the learner was ill-disciplined.
(6)		
Lesson 1 Number of counts.	<i>Code switching was witnessed 23 times/lines out of 70 lines = 33% in lesson 1.</i> <i>Refer to Annexure A for lesson 1.</i>	ANALYSIS
(1)	Group 1: {11} L1 : Ayi nakhu ngicedile sengiya color. Ah yini,	{11} Use of another

	angiyitholi	language - IsiZulu
(2)	{12} L2 : Usebenze nge pen?	{learners are conversing in their languages <u>in their groups</u> to find ways to deal with how they had to do their work}
	{13} L 1 : Eh?	{evidence of a community}
	{14} L 2 : Did you use a pen? To highlight this?	{15} Use of another language – IsiZulu
(3)	{15} L 1 : Oh lez’ abathi ngizenze eyi uyabonake nay eng shayayo mfana.	{similar case}
	{16} L 2: Nawe uyi shaye	Language of solidarity and comfort
(4)	{17} L 1: Oh, ngisebenzise ipeni kulez’ abathi ngizenze?	{17} Code-mixing, “ipeni”
(5)	{26} T : It’s going to help you	
	{27} L 2 : Yes Mam.	{29} Use of another language – Setswana :
	{28} T : What are we doing there?	lack of registers for the word “draw” =
	{29} L 2 : ke tlatla ke drawe fela.	“drawe”: Code-mixing

(6)	{33} L 6: tswantse e shebe kwa	{33} Use of another language – Setswana {artifacts and demonstration}.
(7)	{34} L 7: <u>Akere</u> it must be like that.	{34 – 36} learners

	{35} L 6 : E yalo a kere	encouraging one another and agreeing
(8)	{36} All the others in the group agree: E e yalo	Code-mixing/code-switching.
(9)	{37} L 6 : E yalo, so ... e ke e { <i>pointing at the sketch of lines</i> }	{37 – 39} Use of artifacts by the learners in their own language, Setswana.
(10)	{38} L 7 : <i>Then e ke e</i> , { <i>also pointing at the sketch of lines drawn</i> }	
(11)	{39} L 8 : Le a bona, itswanetsi inne so { <i>showing them the SA flag from a Constitution booklet</i> }	
(12)	{40} L 6 : engwe inne fa inne wide..	Use of another language – Setswana: “inne wide” = code mixing.
(13)	{41} L 8 : bona gore flag e yang? -----	
(14)	{47} T : Transformation, listen, its either reduction of enlargement, so which one was that	
(15)	{46} L 9 : Reduction {49} T: { <i>referring to a certain learner but speaking to the entire class</i> } <i>Le se ke la fojara, e tswane fela like this, ga u yi kryer ibe u e kryer go na yana.</i> Please you must follow the steps, if you don’t follow the steps your flag will never be correct. {50} T : Please! No mistakes!	{49} Use of another language – Setswana. Code-mixing. Use of another language – Setswana and Afrikaans

(16)	{51} L 10 : ... <i>enyane</i>....? {52} T : That <i>small mistake</i> that one.....! {she then moves around helping other learners}..... {53} L 7 : e ko dimo.... {54} L 6 : e e (no) eko dimo ga, ga e....	{51 – 52} – “enyane”=small mistake Interpretation from Setswana to English {53 – 54} Use of another language - Setswana
(17)	{55} L 8 : Eya.... ----- {56} T : Attention again. {<i>addressing the whole class</i>} Attention! Please make sure that you can’t draw and color at the same time. {57} Learners: Yes	NS
(18)	{58} T : Make sure that you draw everything, you	
(19)	highlight the lines that needs to be highlighted, you erase those that need to be erased then you start coloring, please	
(20)	you cannot draw and color at the same time. <i>Learner</i> you are going to make a big mistake. You have a pencil on one side then on the other side you have a coloring pen. {59} L 11: {<i>Learner denying-shook head</i>} ... no... {60} T: There it is, I am talking about this. {61} L11 : E, a ke se drawe	{61} Code-mixing due to shortage of

(21) (22)	{62} T : That is why I am saying, please make sure that you draw everything, after drawing you can start coloring. {63} T : {Referring to other learners who were seemingly cheating the activity} <i>Lona la fojar a la etsa ntho tse.. so... lafojara.</i> <i>{she then moves around helping other learners}.....</i> {64} T : {Talking to a learner } Highlight it, this one, is there any instruction that says erase it? {65} T : {Talking to the whole class} Please you cannot erase all the lines, in the step 7 is not highlighted, the line number 7 must be highlighted first from there you erase. Please if your flag is deurmekaar I am going to mark you wrong and you lose 8 marks. -----	registers: draw = drawe {63} NS {63} Use of another language – Setswana. Code-mixing “forging” = “fojara” NS {65} Use of another language – Setswana and Afrikaans. In order to maintain discipline for doing what is required, while at the same time venting out frustration. {65} Afrikaans language being used: “Deurmekaar” = “confused”
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(23)		
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B. Use of gestures	Transcript: <i>The use of artifacts in lesson 1 happened 9 times / instances / lines out of 70 lines = 13 %</i>	Analysis
Lesson 1. Counts (1)	{14} Some learners : 1. 2 {15} Teacher : So listen to my example: I am paying R14 per day and I am paying that R14, 5 times a week but for a month 22 days, why are you saying 22 days, because I am coming to school 5 times a week, meaning Saturdays I am not coming to school. Therefore because... (<i>interrupted by a learner who entered the class to t..alk to the teacher</i>) ... ----- {16} All learners : 7/4	{15} Use of example {15} NS

(2)	{17} Teacher : Therefore how many days do you come to school? (<i>she writes the responses on the board</i>) : $5 \times 4 = 20$. {18} All learners : 20 days!	{17} Emulates by showing on the board
(3)	{26} All learners : 20 {27} Teacher : It's 20. Therefore, which means how much am I going to pay? This amount....(<i>pointing to the answer of : $14 \times 5 \times 20 =$ _____</i>). This one is the one that I paying per day. (<i>pointing towards the answer</i>). How many days per week? {28} All learners : 5 {29} Teacher : How many weeks per month? --	{26} Uses a personalized/contextualized "I" example and writes to illustrate on the board
(4)	{41} Teacher : We are using it everyday. The question says If one week refers to 7 days, but my week because I am coming to school it's Mon.....Fr. It's 5 days. Therefore it means that my days are going to be 5, and that is why there I am not playing there by 5. Therefore this one says you must 1,3 l of water. How	{41} Uses a personalized/contextualized example: "my week...", "I am..."

	many times per day? ----- -	
(5)	{81} All learners : (<i>realizing their mistake</i>) : No...! Eh....! {82} Teacher : That is why the units must be in rands... ok, <i>I am going to show you how to do 1.4 then I sit down.</i> <i>1.4, 1.4 must be done first.</i> The answer that you got in 1.3 must be converted to kilowatts. I mean sorry, kilolitres. How many litres are there in 1 kilolitre? -----	{82} Demonstration is being used: “I am going to show you”
(6)	{85} All learners : (<i>softly</i>) 1000 {85b} Teacher : 1000, second step you are going to say that answer in kilolitres multiply by 3 comma 4 zero. Why are you multiplying by 3,40?	{85} Teacher tells learners exactly the steps to do : “ second step you are going...”
(7)	{86} Learners : It’s going to be rand.. {87} Teacher : Yes...(demonstrating to the learners by <i>writing on the board</i>) then divide everything by 1 kilolitre. It is going to be..... -----	{86} Demonstrate on the board
(8)	{88} Learners : 1.3 {89} Teacher : Ok 1.3 you all can answer there... (<i>pointing to the board</i>) in 1.3. The first step in 1.4, you take the answer that is there in 1.3 convert it into kilolitres then you get there...(pointing to the step already done/written on the board)... multiply by 3,40 divide by kilolitre , the answer is	{89} Demonstrate on the board = {pointing – body language; and pointing to the steps already done}

(9)	there.. and for 1.4 they are saying answer rounded off into two decimal places, (<i>talking directly to a learner</i>) ... the question is there in a question paper is not there (<i>point at her face/eyes</i>). 1.4 answer rounded off to two decimal places. Why are they rounding the answer into two decimal places? Because you know that when you are dealing with money... because you know that when you are dealing with money you must always have two digits after a comma. So when you are rounding off to two digits, you look at the third number, if the third number is more than 5 you make it one adding to the second number after the comma, if.....”	{89} Clarify a specific algorithm by the use of an example to show procedural steps
Lesson 3	<i>The use of artifacts, body language, etc., in lesson 3 only happened 2 times in two instances of 100 = 2%</i>	
(1)	{13} Teacher : How much water is used to make tea once..? {14} Some learners : 1. 2 {15} Teacher : So listen to my example: I am paying R14 per day and I am paying that R14, 5 times a week but for a month 22 days, why are you saying 22 days, because I am coming to school 5 times a week, meaning Saturdays I am not coming to school. Therefore because... ----- {61} Teacher : Go on with your work please, let’s give you 5 minutes to complete that work, then we’ll report to question 1.2. Please! Make sure that you show all the calculations! Look at this one. (pointing to the board where she had written to illustrate). I am paying R14 per day 5 days per week, 20 days per month, therefore it is going to be one mark for this	{15} Explains with aid of a personal contextualised example: “I am” {61} Makes an illustration: creates a scenario of how the learners can complete their work easier: “look at this one...”

(2)	and one mark for that, that is why if you give the answer only you are going to get one out of two. If I were you not having a calculator, if I were you I may say, I start with making 30, I write the equation right there because I wait for the calculator go for the others, I do the same thing, I go to the next one wait for someone to borrow the calculator. I said you must have your calculator, today is the last day. If you do not have a calculator on Monday I chase you out. You are lazy that is why you cannot do Mathematics.....Do your work, do your work. {62} Teacher : <i>(moving from group to group, helping individual learners)</i>	
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5.3 CONCLUSION

In this chapter I analyzed the data captured from the three data collecting instruments in order to provide answers to my research questions. I made comments and summaries at the end of each data presentation that was made. In ensuring that ethical considerations were observed, I presented and analyzed most of the responses from each of the data sources.

The closed section of the questionnaires was analyzed for all the three schools. I analyzed the data from each school separately and finally made a composite analysis in order to highlight the common trends in all the three schools. The closed section was analyzed through the quantitative data analysis methods and the average/mean scores were calculated using an Excel software. The scores were linked to the statements ranging from 1 to 5, that is, strongly disagree to strongly agree. The open-ended section of the questionnaire was analyzed through the grouping of each response for the same question in all questionnaires. All the responses from all the questionnaires were retyped according to the new order of classification. In this manner, the common views were counted and the corresponding statements were used for analysis.

The interviews were analyzed according to predetermined themes. These themes were used to classify the responses, for example, code-switching, preference for English, use of African languages, policy, etc. Finally the classroom observations were also analyzed following another set of predetermined themes. Inferences were drawn from these observations and conclusions were written in the analysis column and summary of findings. The discussion chapter will provide more insight into the findings and further attempts will be made to answer the research questions of this study.

Chapter Six

DISCUSSION OF THE FINDINGS

6.1 INTRODUCTION

In this report I am seeking to provide answers to the main research questions of my study. I begin by justifying why I have given my topic the title of “Language dynamics” and continue to use this term for focusing and developing my argument. The general views of all the three schools will be reported upon based on the open section of the questionnaire. I captured the views expressed by learners through questionnaires, interviews and those collected during classroom observations for School 1 in which the main research project took place. The views captured were from the learners, parents and the teacher regarding their attitude towards African languages, preference for English, policy, etc.

In each section, I discuss the evidence that led me towards certain conclusions and possible answers to my research questions. I will make justifications for such conclusions in order to ensure ethical, valid and reliable reporting. This will be done by referring to the extracts, tables, interviews, etc., Hence, in each case I expose the underlying language dynamics underpinning language practices being evidenced. I have also discussed the main language practices witnessed during classroom observations and have illuminated my discussions by providing actual quotes from my transcripts. This was done to assist me in focusing my argument in presenting my case of language dynamics. The analysis chapter has been useful in presenting and discussing the findings that were made.

Finally, I have acknowledged the similarities and differences in findings of this study and to those of previous researchers pertaining to language issues, such as Setati and Adler (2001), Moschkovich (1999), Barwell (2003), Pirie (1998) and Zevenbergen (2000). I have refuted and confirmed some of their findings with justifications from the evidence that I have collected. What is of great importance is the manner in which my theoretical framework and tools for analysis have been helpful in analysing my data and understanding how my findings fit within the community of researchers in the same field of study. For example, in my theoretical framework, I used Lave and Wenger’s (1991)

theory of the community, domain, and practice. This is because the Ex-Model C school was viewed as a multilingual community in which learners were doing Mathematics, which was the common domain and had to deal with language challenges, which was the practice. The names of learners used in the last discussion are pseudonyms.

6.2 THE RESEARCH AIMS

In this study I investigated the different challenges associated with the presence of more than one language in the Mathematics classroom. The key aims were to investigate:

- how learners and teachers in Ex-Model C Schools deal with issues of language diversity in Mathematics classrooms;
- how the diversity is used (or not used) as a resource by teachers to assist learners access mathematical knowledge;
- how the Language-in-School Policy could be better implemented for the benefit of all Mathematics learners and
- whether or not the language practices are in line with the Language-in-School policy.

6.3 LANGUAGE DYNAMICS

In this chapter I provide convincing evidence of the language dynamics that prevail in Ex-model C Schools of Gauteng West District, Johannesburg in Gauteng Province. The education reforms that emanated from the abolishment of apartheid resulted in multi-racial and multilingual schools (SASA, 1996). Some of these challenges were the language discourses (Moschkovich, 1999) which manifested as discontinuities due to ESL learners' difficulty in accessing Mathematics because of low proficiency in the English language.

This part of my discussion partly addresses my first research question in which I sought to verify the presence of different languages in Ex-Model C Schools. It was established that the majority of learners attending Ex-Model C schools were second language speakers of English (ESL) who had to learn all of their subjects, including Mathematics,

in English. For example, the evidence from Table 7 and Question 1 shows that all the 27 learners who were competent in English were also competent in Setswana. This confirms that the whole or majority of this group were first language speakers of Setswana. From my experience as a teacher, most educators use African languages to teach Mathematics in township schools. It can therefore be established from this observation that these were indeed ESL learners who would encounter challenges if taught in English alone.

Table 7 Question 1 reveals that the number of languages that were spoken in the classroom was eleven. This is the actual number of all the official languages in South Africa (SASA, 1996). It was therefore necessary to investigate how these learners who spoke different languages coped and handled language diversities while seeking to learn Mathematics at the same time.

In a similar manner, Table 7 Question 7 revealed that when English became a problem the learners spoke their own different vernaculars. The learners might have developed competencies in African languages as they sought to communicate with their peers considering that all the eleven languages were spoken in the Mathematics classroom and when English got in the way of expressing their feelings, the learners resorted to African languages. Setati (2002) discussed how African languages were used as a language of solidarity for both learners and the teacher. In such cases, language was used as a form of solidarity and solace for the learners, as confirmed by (Setati, 2002) as well.

This study seeks to reveal how learners use these languages for learning Mathematics. One of the quotes expressed in this study to capture the use of African languages by learners was, “*in cases where they cannot express themselves in English*” they would switch languages. (See Table 7 number 7, as expressed by the learners.)

The classroom observations, as transcribed in Table 12 line 11- 17 and line 33 – 41, show the learners communicating in their African languages, which is Zulu and Setswana in this case. Later on, in this conversation we see the educator joining the conversation and speaking in Setswana. The evidence gathered verified the presence of language

differences in this Ex-Model C class which affected the teaching and learning of Mathematics.

6.4 FINDINGS FROM LEARNERS' VIEWS

6.4.1 ATTITUDE TOWARDS AFRICAN LANGUAGES

Table 4 Question 1 revealed that the language for the teaching and learning of Mathematics by most learners is English. Learners felt strongly that mathematics is easier in English than in African languages. On the contrary, learners acknowledged the importance of African languages and how, in their view, African languages are not inferior although they did not see the usefulness of African languages in learning Mathematics. In spite of learners admitting that they did switch language codes in cases where they did not understand English, their attitude towards the formal use of African languages for learning Mathematics was negative. These findings correspond to the findings by Barwell (2003) in which language was seen as a cultural tool for learning and probably to facilitate learning.

The evidence from the interviews, Table 9 Question 6, revealed that the learners interviewed were against the switching of language codes. However, the evidence gathered during classroom observations was contrary to these views. In Table 12 line 11 – 17, learners spoke in their African languages freely expressing their thoughts about completing their Mathematics work. Hence it is clear that African languages played a significant role in the learning and teaching of Mathematics, and this significance had not been realized by the learners. The language dynamics prevailing led to the conclusion that indeed code-switching did occur at Ex-model C Schools in order to deal with situations where learners could not express themselves clearly in English. Moschkovich (1996) showed the benefits of learning Mathematics through the situated model in which learning could be situated in the language discourses in order to facilitate learning. This meant that learning Mathematics in another language of a familiar background could have assisted in grasping certain Mathematics concepts.

6.4.2 PREFERENCE FOR ENGLISH LANGUAGE

It was established earlier in this chapter that all African languages were present in the Ex-Model C classrooms and that from the evidence gathered through classroom observations, learners were indeed using African languages to learn Mathematics when they did not understand English.

In the learners' views revealed by Table 1 Question 6, they were not sure whether by not understanding English, it followed that one would not understand Mathematics. It was Star (1995) who confirmed that the lack of English does not imply an inability in Mathematics. This suggests the possibility of using African languages for learning and teaching of Mathematics and hence the importance of this observation in answering the second research question. While the point was taken that learners preferred English in learning Mathematics, as shown in Table 4 Question 1, there was a need to establish the rationale behind learners' preference. Could they have come to attend Ex-model C Schools to learn Mathematics in English? Could this also, have been the reason why they preferred English even though their African languages did assist them where their command of English was inadequate? Wenger (1991) alluded to the fact that learners develop repertoires in which they develop mental images of how they prefer to see themselves. The conclusion that can be drawn from this observation is that the Ex-Model C learners would like to possess different identities of themselves, and learning in the English language was seemingly one of the ways they viewed themselves learning.

The other factor to investigate for the preference of English were the views of parents as revealed in Table 1 Questions 7, 8 and Table 2 Questions 7 and 11. The evidence showed clearly that it was the parents who were responsible for sending their children to these Ex-Model C Schools. However, whether this meant that they were sending them to Ex-Model C Schools to learn English needed to be established. Furthermore, in Table 10 Question 5, the educator confessed that the parents were happy when their children spoke English. This suggests that parents wanted their children to learn English and therefore their sending of learners to Ex-Model Schools is an expression of this desire. This confirmed the views expressed by Setati (2003) in which parents were found to be driven

by the need to purchase the social goods which only English could provide. Table 8, number 7 further confirmed this as parents commented about learning in English that, *“the mathematics is better in English, to avoid challenges for future, tertiary education....”*

It remains clear therefore that though English was the preferred language for learning and teaching Mathematics by learners and parents, it is not clear whether the status of African languages diminishes in the light of English preference. This is due to the fact that African languages played a role in facilitating learning in Mathematics especially the code-switching that took place, as seen in the classroom observations Table 12 line 11-17 and line 33 – 41. Zevenbegen (2000) explained that language could be used as a form of discrimination and in this case African languages are being discriminated, or treated as less important in favor of the English language.

6.4.3 USE OF OTHER LANGUAGES DURING MATHEMATICS LESSONS

There was conflicting evidence in the views about code-switching as presented in the analysis chapter in which learners’ questionnaires revealed that learners were in favor of code-switching, but their interviews showed that they were not. The aim of this study was to investigate the manner in which languages were used, irrespective of whether these were African or English. Also, the subsequent research question was to investigate whether this usage of languages does or does not assist in the teaching and learning of Mathematics.

Firstly in the views about code-switching, the interviews with the learners in Table 9 Question 6 revealed that learners were not in favor of such language practices for learning Mathematics. Secondly, in the learners’ questionnaires, in *Table 7 Question 9, they approved of code-switching (using other languages other than English to explain) if it could assist them.* The second statement was supported by the parents’ views as expressed in Table 8 Question 10 in which parents also confirmed that they did not mind the use of African languages in the learning of Mathematics as long as it assisted their children. Furthermore, as indicated earlier, the educator, in Table 10 Question 6, clearly stated that she was not in favor of code switching as she was not able to use other African

languages. On the contrary, the evidence gathered during classroom observations revealed that both the learners and the teacher did code-switch, as seen in Table 12 line 11-17, line 33-41. The conclusion that could be drawn from these findings is the fact that during the actual learning encounters, the actual reality was revealed: that language dynamics exist in the form of code-switching which is, for this study, the use of African languages. Adler (2001), in her study undertaken in Mohlakeng revealed a case in which a teacher refused to use African languages though the video evidence showed learners communicating in an African language that she herself spoke. This practice seemingly denied the learners an opportunity to learn better. Adler's findings concur with the findings of this study given that the educator in this study denied the use of code-switching but classroom observations confirmed that she did code-switch.

The purpose of code-switching, as seen in Table 12 line 63 shows that this was done by a teacher to maintain discipline and order in this classroom. After speaking in an African language, the English language was then used. Line 65 and 78 revealed that the teacher used it for expressing frustration and anger towards the learners for not meeting her expectations. It is not clear why the educator was not aware of code-switching for maintaining discipline and order in the classroom so that she could teach better in the English language. I argue that in my experience as a teacher, learning is facilitated by other factors (artifacts) as well, and speaking in an African language does facilitate learning as observed from the teacher's pattern of teaching: using an African language first, and then the English language.

Whilst the teacher used African languages for maintaining order in the classroom, learners used it for clarifying mathematics tasks they were attempting. The evidence also revealed that there could be some language discrimination underlying such practices: the fact that African languages are used for seemingly less significant tasks while only English is used for learning and teaching, as Zevenbergen (2000) pointed out. Barwell (2003) alludes to the socio-cultural factors which can assist in learning, of which is a crucial factor.

6.4.4 SCHOOL POLICY AWARENESS

In Table 10 Question 6 the educator alluded to the fact that she used English since she could not use all African languages that were spoken by the learners in her classroom. However, the evidence presented in Table 10 Question 1 and Table 1 Question 9 revealed that her main language was Setswana and that all learners actually understood Setswana. Setswana was the dominant African language. Though she could have been aware of this she chose not to use her language to enhance her teaching in cases where learners did not understand the English language.

Table 9 Questions 4 and 5 shows that school policy on language usage did not have much effect. Learners interviewed stated that they were not aware of such a policy as indicated in Table 9 Questions 4 and 5. This is because other languages may not have been acknowledged by the policy in preference of English and Afrikaans, as seen in Table 10 Question 1. The educator agreed that since she could not use all learners' languages she had rather use English. This meant that by using English she satisfied all the learners and hence she was being fair to all other languages, as indicated in Table 10 Question 3. But this practice led to the privileging of the English language. This might also mean that the language diversity was not harnessed by the educator for learning Mathematics as English was preferred.

In answering one of the research questions, learners had not made any contribution to the formulation of the language policy that affected their learning. This is probably due to the fact that they preferred English for learning and teaching even if using their African languages could have assisted.

6.5 FINDINGS FROM PARENTS' VIEWS

6.5.1 ATTITUDE TOWARDS AFRICAN LANGUAGES

In the preceding paragraphs it was observed that learners are not in favor of African languages for learning Mathematics. It became important to compare with parents' views on the usage of African languages in Ex-Model C Schools. Table 8 Question 1 revealed clearly that parents would like to have their children learn in English. This was also verified by the same Table 8 Question 4 and 7 in which parents were not in favor of mother tongue instruction.

In Table 2 Question 6, parents felt strongly that a weak command of English does not equal poor performance in Mathematics. This suggested that the knowledge of Mathematics is independent of proficiency in the English language. It was therefore somewhat ironic that they still preferred English for the teaching and learning of Mathematics for their children.

Furthermore, in Table 8 Question 10, parents confirmed that they did not mind if the educator code-switched in order to help learners understand Mathematics. This is particularly in cases where English could become a barrier to learning Mathematics, as alluded by Moschkovich (1999) in the discontinuity model. Hence the parents' attitude towards teaching in African languages was not completely negative. They thus preferred English ahead of African languages, in order for their learners to purchase the social goods that come with English proficiency (Setati, 2003). This observation is confirmed by the findings in Table 8 Question 7.

6.5.2 PREFERENCE FOR THE ENGLISH LANGUAGE

In Table 8 Question 1 all the parents at the school understood English. Table 7 Question 6, verified that it was the parents who sent their children to Ex-Model C Schools, so that their learners could also learn the English language. They were fully aware, according to the evidence in Table 2 Question 2, however, that their children were allowed and able to speak their African languages freely during learning and teaching. It was during these classroom interactions that learners code-switched from the English Mathematics to any

African language. This was seen during classroom observations as discussed earlier on in this report. It could be stated without doubt that this was one of the ways in which the language diversity expressed itself.

The teacher's views coincided partly with the parents' views for the preference of English over African languages, as seen in Table 10, Question 5, Table 2 Question 7 and 10, Table 1 Question 7 and 10. However, the teacher's view differed from that of parents, with the latter in favor of code switching whereas the former was not. Adler (2002) pointed out the lack of registers in African languages for learning Mathematics and the educator confirmed that this was one of the reasons for preferring English (Table 10 Question 6).

Although the use of African languages could not be excluded from learning Mathematics, the impact made by these languages was not acknowledged especially in the language policy. The UNESCO report (2004) highlighted the fact that what is intended by language policy did not correspond to implementation. This report further explained that if the usage of African languages could be a powerful tool towards learning Mathematics then these languages should be tapped to help, in this instance, ESL learners with a weak command of English at Ex-Model C schools. Mosckovich (1996) also explained how the situated model could assist in accommodating such language practices as well as other tools to promote learning.

Finally, as was the case with learners who showed preference to English, a similar viewpoint was expressed by parents in this section. Though they would not mind to benefit from use of African languages during Mathematics lessons, they felt that the usage of such languages should probably be kept at minimum and nothing further. Once again, this confirmed the language diversity at such schools but how the diversity was not manipulated to the advantage of ESL learners through preference for English.

6.5.3 SCHOOL POLICY AWARENESS

Parents' views influence the formulation of policies through the SGB's (Schools Governing Bodies) (SASA, 1996). As was seen in the preceding sections of this discussion, parents were not completely in favor of African languages being used for the learning of their children.

In Table 2 Question 8, the parents pointed out that all languages were indeed equal and should all be treated equally. This is according to the South African Schools Act, in conjunction with the Bill of Rights (SASA, 1996). The parents agreed that their school's language policy favored certain languages. However, they showed no willingness to effect language changes in spite of possessing policy formulating powers. This is probably because of the social goods which the English language can provide, indicated earlier. Hence, in answering my third research question, parents were unaware of how policy could have been changed or used to assist learners learn Mathematics through the use of other languages.

The facts provided in this discussion about the manner in which languages are used for the learning and teaching of Mathematics should warn parents that if they do not promote their indigenous languages which are hardly used by their children, these languages run the risk of not being used at all in the classroom in the near future (SASA, 1996).

6.6 FINDINGS ABOUT THE TEACHER

6.6.1 ATTITUDE TOWARDS AFRICAN LANGUAGES

The educator's attitude towards languages, especially African languages, was critical for their usage or lack thereof in the Ex-Model C classroom. In Table 1 Question 1 and 2, the educator stated that she taught in English according to the school policy which singled out only English or Afrikaans as languages to be used for learning and teaching. Probably this explains her efforts in keeping to the school's language policy which allowed only English and Afrikaans for learning and teaching.

As stated earlier on and as reflected in Table 7 Question 1., all the learners in the classroom could speak the teacher's mother language, Setswana. In spite of this, the educator stated that she was unwilling to use Setswana for learning and teaching stating that the lack of registers was a challenge for her as well as the fact that there were many other African languages. This claim can be seen in Table 7 Question 6.. Hence the teacher ignored the fact that in her class all the learners could understand Setswana since she was trying very hard to comply with the school's language policy.

The educator's attitude to the usage of African languages is not favorable as she admitted that code switching would be impossible for her. However Table 12 Line 11-17, and line 33-41 showed learners using Setswana and Zulu, and these learners were joined by the educator who also spoke Setswana. Hence, as was the case before, the conclusion made in this case was that code-switching did occur, regardless how, and this assisted learning. These language dynamics occurred in spite of the teacher's denial that she was not engaging in them.

6.6.2 USE OF OTHER LANGUAGES DURING MATHEMATICS LESSONS

In Table 10, Question 4 revealed that the educator had to use English to accommodate other learners who might not know a particular African language. Using one African language was seen as unfair to the rest of the other learners in the classroom. It is very surprising how the educator did not realize that by trying to accommodate every learner and using English only, this practice further promoted the use of one language over others. This is rather curious because the South African constitution states clearly that all eleven languages should be treated equally (SASA, 1996).

As stated earlier on, and seen in Table 10 Question 6, the educator was not comfortable with code-switching. But the parents did not mind code-switching as long as it assisted learners' understanding of Mathematics, as indicated in Table 7 Question 7, and Table 8 Question 10. Also, Table 7 Question 9 did reveal that even the learners at some point would not mind to be assisted with the use of African languages if they did not

understand English. Furthermore, the learners did confirm that if one of their friends did not understand Mathematics because of the language, they would use their African languages in order to explain.

In spite of all the evidence pointing towards the possible usage of African languages for learning and teaching of Mathematics it is surprising that there was no clear acknowledgement of such, confirming a case of language discrimination as explained by Zevenbergen (2000).

6.6.3 SCHOOL POLICY AWARENESS

One of the stereotypes from the preceding paragraphs is that English is used for equity and fairness as also reflected in Table 10 Question 3 and 4. What was odd about this view was that the educator was not aware that it led to the promotion of the English language. It can be stated at this point that the school's language policy was not in line with the constitution of the country.

It was stated that such unfair practice as seen above, was perpetuated by the fact that though at some point the parents did allow for code-switching, as seen in Table 7 Question 7, they were opposed to the entire usage of African languages, as seen in Table 8 Question 7. As part of the policy making structure of the school, their lack of influence in policy making which could have ensured the usage of African languages resulted in the teacher's attitude against these languages.

The usage of English at Ex-Model C Schools is part and parcel of their status and what makes these schools be perceived by township communities as better schools. This was confirmed by parents stating that "*it is an English school*", (see Table 8 Question 7), and hence their choice to send their children to such schools since attending these schools is tied with assuming a new and better identity as Lave and Wenger (1991) observed..

In answering the third research question, the policy did not contribute favorably towards the fair usage of languages especially in assisting learners learn Mathematics better. This is because of the perpetual usage of English that characterized Ex-Model C schools.

6.6.4 HOW LANGUAGES WERE USED: CLASSROOM OBSERVATIONS

In this part of my discussion I discuss the manner in which languages were used. These will include both English and African. It has been established that in as much as the learners, the parents, the teacher and policy favored English over other languages at School 1, the classroom observations revealed that learners as well as the teacher did use African languages. In this discussion I am also going to focus on the reason behind language usage, for example, why the educator translated, or code-switched and whether doing so did or did not assist in the learning of Mathematics.

Since English is the dominant language that was used during classroom observations, and the majority were ESL learners, I will focus more on three language practices under the following themes:

- 1) Re-voicing;
- 2) Code-switching; and
- 3) Artifacts usage including body language.

One of my research questions is to establish how the teacher developed strategies to assist the learners using language, that is, to understand the English as well as the Mathematics at the same time. Her usage of language for teaching and learning should reveal the teaching skills that have worked for her in dealing with multilingual learners. I have referred to these language practices as language dynamics.

A) REVOICING

Re-voicing occurred 7 times in 20 lines out of 70 lines in total = 29% as observed in lesson 1. Re-voicing as “teaching patterns” occurred 6 times as a teaching method. Re-voicing occurred 31 instances of re-voicing of 44 lines out of 100 lines in lesson 3 = 44 %. Refer to Annexure A and B for lesson 1 and 3.

During classroom observations, one of the language practices that was observed was re-voicing. The lesson under discussion is lesson 3. For the sake of this study, re-voicing is my main theme while interpretation, translation, re-explanation and repetition are sub-themes. I will discuss the instances in which these were evident and elaborate with extracts from the lesson transcript:

1) The first case observed was when a learner uttered “seven day” instead of “seven days”. The “s” for the plural of “day” was not pronounced and the teacher was making the learner’s answer conform to proper English. There was no Mathematical concept that was being learnt, only the English language. Earlier on, it was noted that parents prefer their children to attend Ex-Model C Schools so that they can learn English, and this extract proves this fact:

{8} Learner 2 (Steven) : (*continues to read*) ... if one week refers to seven day, and one.....

{9} Teacher : seven days

2) The following case revealed how the teacher rephrased for the learner the expected manner of answering the question. The learner’s response was not in a question format and the teacher did it for the learner. If one views the task required by the question it is clear that the mathematical reasoning or calculation was required and so the teacher focused the task on “...make tea once...?”

{11} Teacher : What is the question please.....? 1.1.1

{12} Learner (Steven) : Making tea...

{13} Teacher : How much water is used to make tea once?

Most second language learners of English (ESL) often did not know what exactly the question required and answering such Mathematical questions was a skill in itself that had to be learnt during the learning and teaching process of Mathematics.

3) The third case is similar to the one above. However, in this instance a partly correct answer had been given. The question asked by the teacher was "...how many times a day?" The learner said "3 times" and left out "a day". Hence it was not just "three times" but "3 times a day". Once again learners had developed a tendency of not answering a question in an acceptable manner, though the answer was correct it had to answer the question succinctly:

{37} Teacher : R288. (learners talk in Setswana, mocking the one who gave the wrong answer) Therefore the first question is saying you are using 1, 2 kilos of water how many times a day?

{38} One learner : 3 times

{39} Teacher : 3 times a day. How many times per month?

{40} Another learner : 3 times

The mistake above of leaving out "a day" can probably be done by someone who has no regard for the use of proper language or is very careless. It is worth noting the manner in which such cases were handled in the class in question.

Re-voicing of learners' thoughts, ideas and conceptions was not optimized during this lesson because the teacher did not cater for learners' discussion work. Hence, learners

had to listen and follow what the teacher wanted them to do and then move on to the next task, and there was no self discovery by learners to further reveal how re-voicing could have been used to learn Mathematics better.

REPETITION AS A TEACHING METHOD

There was an observable pattern in this lesson in which the teacher kept on repeating learners' answers several times and it became clear that this was definitely a teaching strategy. After the learners had said or answered correctly, almost 8 times in this lesson, the teacher repeated their answers:

1) The first one is the repeat of the answer "20 days":

{17} Teacher : Therefore how many days do you come to school? (she writes the response on the board) : $5 \times 4 = 20$.

{18} All learners : 20 days!

{19} Teacher : Is it 20?

{20} All learners : Yes!

{21} Teacher : It's 20. Therefore if....

2) It must also be mentioned that the teacher often used the learners' answers as a lead for more probing and insightful questioning for learners to understand in order to build learners' confidence through what they had answered. The teacher repeated, "It's 20. Therefore,...", and then proceeded to probe further. This was the case in the following extract in which a follow up question was asked:

{26} All learners : 20

{27} Teacher : It's 20. Therefore, which means how much am I going to pay? This amount....(pointing to the answer of : $14 \times 5 \times 20 = \underline{\hspace{2cm}}$). This one is the one that I am paying per day. (pointing towards the answer). How many days per week?

3) The teacher repeated what the learners had answered probably to add more confidence and assurance to their answer and to re-affirm the learners' good work in order to foster confidence. In applying Lave and Wenger's theory (1991) learners who might have not developed language expertise would need to build their self esteem in order to affirm themselves and extrinsic motivation from the teacher proved to be very useful.

The following extract is the usual repeat by the teacher after the learners had answered the question correctly:

{36} All learners : R288.

{37} Teacher : R288. (learners talk in seTswana.....

4) The extract below revealed also the fact that it was not about getting the answer but that there was something about the answer that could be verified. Most learners would have preferred to stop at the answer "30 times" without asking themselves whether this answer made sense or not, and the teacher continued by saying "30 times, that's what you...." qualifying the answer.

{46} All learners : 30 times

{47} Teacher : 30 times, that's what you....

5) In this extract it would seem as if the learners had answered the question incorrectly by saying "twice per week" and "2" and the educator probed further by asking a more

revealing /rephrased question to the answer that the learners were seeking, “How many weeks are there in a month, are they two?”

{56} All learners : twice per week

{57} Teacher : Twice per week *a kere*? Therefore it’s going to be 50 times...

{58} All learners : 2

{59} Teacher : Is it times two? How many weeks are there in a month, are they two?

It seemed as if learners’ conceptualization of conversions of times, i.e. days and weeks, etc. was insufficient. Learners did not take into account what they were asked and how to answer. In this case this was probably because converting is a Mathematical concept, which has two processes: forward and backward. For most ESL learners one way seemed easier. Adler (2001) did allude to the fact that formal mathematical language required more than informal spoken English, that is, knowing the mathematical concepts.

6) The following extract is the one in which the teacher used a counter example to show why it was appropriate to answer in rands and not in metres. She enquired “...are you going to pay in metres?” The learners had to get a sense of units and for what purpose they were used:

{79} *Betty* : It’s going to be in rands.

{*Betty* is the learner’s pseudonym}

{80} Teacher : It’s going to be *rands* because they are saying, how much will you pay... are you going to pay in metres?

The most powerful tool the teacher was using was that of justifying why it's going to "... be rands because they are saying, how much will you pay...." Hence learners should have known the difference between the units of metres and rands and that these are different measurements/quantities, which would not be used interchangeably as they might have presumed. Hence repetition had become a teaching tool for the teacher and she eagerly awaited for her moments of exposing the truth and dispelling any underlying misconceptions through continuous repetition of learners' answers.

7) In the following extract yet again the teacher *affirmed* that the learners had accomplished step number one and now could progress to the next one:

{85} All learners : (softly) 1000

{85b} Teacher : 1000, second step you....

8) In the following case, the teacher said: "...you all can answer...." The inference I made from this statement was firstly, that the question was easy and even the slowest learner should be motivated to attempt and get it right. The second inference is that after the repeat of the correct answer by the teacher, the learners were confident in themselves to accomplish even harder tasks. Once again, Lave and Wenger' s (1991) activity theory is confirmed as learners appeared to be developing self- repertoires needed to succeed in a new environment with new language and conceptual demands.

{88} Learners : 1.3

{89} Teacher : Ok 1.3 you all can answer there...

B) ARTIFACTS:

The use of artifacts in lesson 1 happened 9 times / instances / lines out of 70 lines = 13 %. The use of artifacts, body language, etc., in lesson 3 only happened 2 times in two instances of 100 = 2%. Refer to Annexure A and B for lesson 1 and 3.

The following extracts provide instances in which the educator undertook the task of demonstrating to the learners what was expected and through the use of examples and modeling answers on the board the learners could answer other questions linked to the main question. Learners were expected to watch the educator demonstrate the required and correct steps to achieve a task and then follow suit. The use of artifacts, body language and contextual examples seemed to have assisted ESL learners to familiarize themselves with the Mathematics procedures that were required in order to achieve a task.

1) The first instance showed the teacher giving a made up example which she was using to illustrate what needed to be done: “So listen to my example: I am paying R14 per day and I am paying....” Probably this came after she perceived that the learners were somehow struggling to answer the question asked and in order to help them she decided to use a personalized example:

{14} Some learners: 1. 2

{15} Teacher : So listen to my example: I am paying R14 per day and I am paying that R14, 5 times a week but for a month 22 days, why are you saying 22 days, because I am coming to school 5 times a week, meaning Saturdays I am not coming to school. Therefore because... (*interrupted by a learner who entered the class to talk to the teacher*) ...

The above instance was very important for the ESL learners since due to their language limitations they could not express in English certain concepts that were removed from

their contexts and backgrounds. Hence using a more familiar example catered for the language deficit.

2) In the extract below, by writing on the board what the learners ought to have written, she provided a clearer method of what the learners ought to have done. She came down to their level and demonstrated the required steps:

{16} All learners: 7/4

{17} Teacher : Therefore how many days do you come to school? (*she writes the responses on the board*) : $5 \times 4 = 20$.

{18} All learners : 20 days!

3) The following extract is similar to the one discussed above in which the learners were showed on the board what to do. However the teacher, after repeating the answer “It’s 20...” proceeded to ask “...which means how much ***am I going to pay?*** This amount....(pointing to the answer...”. The words “am I going to pay?” personalized the question and the learners were now faced with a realistic situation in which an answer had to be found and applied. She also ***pointed towards the answer*** as she had written it on the board and learners were required to do the calculations themselves.

{26} All learners : 20

{27} Teacher : It’s 20. Therefore, which means ***how much am I going to pay?*** This amount....(pointing to the answer of : $14 \times 5 \times 20 = \underline{\hspace{2cm}}$). This one is the one that I paying per day. (pointing towards the answer). How many days per week?

{28} All learners : 5

{29} Teacher : How many weeks per month?

By personalizing the question and applying it to a real life situation, the teacher broke the rigid mathematical code of Mathematics language, that is, mathematising, and this helped the learners to own and appropriate certain removed concepts of Mathematics. In this case, converting between days, weeks and months which seemingly had to be initially imagined as a real life event for it to make sense to the learners. Eventually the English language did not become the factor hampering Mathematical understanding.

4) A replica of the situation just mentioned above is portrayed below:

{41} Teacher : We are using it everyday. The question says If one week refers to 7 days, **but my week because I am coming to school** it's Mon.....Fr. It's 5 days. Therefore it means that my days are going to be 5, and that is why there I am not playing there by 5. Therefore this one says you must use 1,3 l of water. How many times per day?

5) In the journey of developing repertoires, modeling coupled with mentoring becomes useful tools in order to assist learners deal with learning challenges, as Lave and Wenger (1991) observe. In the following extract, the teacher said: “, **I am going to show you how to do 1.4 then I sit down. 1.4, 1.4 must be done first**” This took the load of difficulty off the learners to the teacher who was willing to do the task for them. Note that the learners did realize their mistakes and were aware of their shortcomings:

{81} All learners : (*realizing their mistake*) : No...! Eh....!

{82} Teacher : That is why the units must be in rands... ok, **I am going to show you how to do 1.4 then I sit down. 1.4, 1.4 must be done first**. The answer that you got in 1.3 must be converted to kilowatts. I mean sorry, kilolitres. How many litres are there in 1 kilolitre?

In this problem the challenge again was about converting from one quantity to the next, and as seen previously, learners had difficulties in such mathematical manipulations.

6) In the following extract the following deductions were observed:

- (a) the teacher repeated the answer “1000” to affirm their efforts and good work,
- (b) she followed the learners’ reasoning of the problems, “second step you are going to say that answer in kilolitres multiply by 3 comma 4 zero...” ,
- (c) followed up to probe further for more understanding by asking a question, “Why are you multiplying by 3,40?”,
- (d) and then demonstrated exactly how the learners ought to have done it by writing on the board, “Yes...(demonstrating to the learners by writing on the board) then divide everything by 1 kilolitre. It is going to be.....”

{85} All learners : (softly) 1000

{85b} Teacher : 1000, second step you are going to say that answer in kilolitres multiply by 3 comma 4 zero. Why are you multiplying by 3,40?

{86} Learners : It’s going to be rand..

{87} Teacher : Yes...(demonstrating to the learners by writing on the board) then divide everything by 1 kilolitre. It is going to be.....

The pattern observed was typical of the teaching methods that the educator was using throughout her lessons for teaching Mathematics. It was a set approach that only changed on few occasions by including a personalized example. A question can be asked whether she aware of this practice or she was doing it ignorantly. The answer to this question could unlock more teaching strategies for Ex-Model C educators.

7) The skill that is being repeated underneath was that of rounding off and the logic behind doing so. The conversation by the teacher was very long, repetitive, had the use of

demonstrations and directing questions to learners to answer. This is a perfect environment for learning for learners whose English language was challenged and needed the teacher to use more teaching methods in order to help them understand:

{88} Learners : 1.3

{89} Teacher : Ok 1.3 you all can answer there... (pointing to the board) in 1.3. The first step in 1.4, you take the answer that is there in 1.3 convert it into kilolitres then you get there...(pointing to the step already done/written on the board)... multiply by 3,40 divide by kilolitre , the answer is there.. and for 1.4 they are saying answer rounded off into two decimal places, (talking directly to a learner) ... the question is there in a question paper is not there (point at her face/eyes). 1.4 answer rounded off to two decimal places. Why are they rounding the answer into two decimal places? Because you know that when you are dealing with money... because you know that when you are dealing with money you must always have two digits after a comma. So when you are rounding off to two digits, you look at the third number, if the third number is more than 5 you make it one adding to the second number after the comma, if.....”

C) CODE SWITCHING

THE USE OF OTHER/AFRICAN LANGUAGES

Code switching Occurred 6 times in 6 lines out of 100 lines = 6%, refer to Annexure B, in lesson 3. Code switching was witnessed 23 times/lines out of 70 lines = 33% in lesson 1. Refer to annexure A for lesson 1 and B for lesson 3.

In this lesson there were 5 instances of code-switching. In this study code-switching applies to the use of other/African languages and words directly taken from these languages. It is expected that both the learners and the teachers strictly use English in order to comply with the language-in-school policy and also comply to the wishes of the parents. The teacher, as seen before, has indicated that she would not prefer code-

switching due to the lack of registers in her main language, Setswana. Table 10, Question 6.

Though it was discussed that the learners would not mind code-switching as seen in the questionnaires, but later on contradicting evidence from the 3 learners interviewed showed that they do mind and would not prefer to do so as it might confuse them (Table 9 Question 6. Also see Table 7 question 9).

Furthermore, in following the inferences made below one must consider that the most spoken African language in School 1 was Setswana as all the learners knew it and spoke it, coupled with other African languages. The evidence produced here provides convincing proof of what the teacher and the learners said they were doing against what they really did during classroom observations. The video recorder recorded all incidents as they occurred and actual conversations were recorded the way they were heard and transcribed verbatim.

Also note that the extracts used here are taken from lesson three only, though extracts in the analysis were also taken from lesson one. Refer to Annexure A and B.

The following extracts showed code-switching mainly for 5 purposes: maintenance of class order, correcting a mistake, affirmations, clarity seeking and expressing frustrations.

1) **MAINTAINING ORDER**

In the following instance, since it was the beginning of a lesson, classroom order had to be maintained before the lesson could begin. In this case the educator spoke in Setswana reprimanding the learner over undesirable behavior:

{1} Teacher : *(Hands out learners' workbooks, calling each learner by name to come and collect from the front. One learner decides to take for others sitting at the back, and the teacher speaks in Tswana trying to stop her and she responds in Tswana that she is doing this for those sitting at the far back of the class.... " ... ke tla ditlisa ko morago...."*

{2} Teacher: (*reprimanding a learner in the front group in Tswana, speaking in a low voice*) “ **Bona...**

2) CORRECTING MISTAKES

In this instance, after a learner had uttered an incorrect statement, the teacher tried to correct him by saying “..nna ke go buleletsi..” which meant “did I not tell you”. The reason why the educator chose to say this in Setswana than in English was to reprimand the learner so that s/he could be attentive to her instructions and thereby avoid mistakes. In order to emphasize attentiveness among the learners when she was teaching she uttered this phrase.

{47} Teacher : 30 times, that’s what you will calculate the amount of water that you are going to use for tea it is going to be 1, 2 times...?

{48} Steven: times seven (utters an incorrect answer)

{49} Teacher : it’s sleepy (speaking in another language”...nna ke go buleletsi..) Is it times 7? ... cause you are using it three times a day!

It is not clear why she did not say this in English but in Setswana as if the learner would not understand the same message in English.

3) AFFIRMATIONS

The educator was quoted as saying “a kere?” which mean : “Isn’t it?”. This was a rhetorical question affirming/confirming to the learners that the answer given was indeed correct. As stated earlier on, for ESL learners the language of English is a deficit and they probably needed more affirmations in their own familiar language to gain more confidence in English. Hence the issue of familiarity leading to improved confidence and self learning, as Lave and Wenger (1991) mentioned.

{55} Teacher : washing clothes?

{56} All learners : twice per week

{57} Teacher : Twice per week *a kere*? Therefore it's going to be 50 times...

{58} All learners : 2

{59} Teacher : Is it times two?

4) CLARITY SEEKING

It was observed that learners did code switch more regularly especially when they were engaged in classroom discussions (Table 12, line 33 – 41). Parents did confirm that they were aware that their learners did use their languages at school, and the educator did not try to stop them from doing so. However, it was observed that the teacher spoke generally in English and seldom spoke in Setswana, as could be seen in this lesson discussion.

The following is an instance where the teacher asked a learner a question, and in order to seek more clarity the learner asked in Setswana and said: “Efung” which meant: “Which one?” Here the learner was not following and needed to understand exactly which question to read as apparently there were many questions. But why did the learner ask in Setswana? Unfortunately the teacher did not follow this up or even clarify to the learner according to the learner’s expectations and request.

{69} Teacher: Attention, we need to get the information so that we cannot stop writing. Attention, 2.2 let us read the question and then we go back to 2.1, let's read the question in 2.2, anyone who can read the question for us? *Tom*, can you please read the question for us?

{*Tom* is the learner's pseudonym}

{70} *Tom* : *Efung*?

{71} Teacher : Show by calculation that Mr Molaka's family will be using more water than free 600 l of water given per one, to cover the basic needs.....

5) EXPRESSING FRUSTRATION

This extract was an instance of built up frustration from the teacher. In line 76-77 the teacher was trying to make sure that the learners were succeeded in carrying out tasks. The trouble began in line 78 when the educator realized that the learner was still behind in 1.3 rather than in 1.4. Her frustrations were expressed by the phrase "...I am talking about.... *Tom*, ***ke mang...***? I 'm talking about 1.4 not 1.3,..." The Setswana words "...*ke mang...*?" meant "who is it" while referring to *Tom* implied that for a moment she forgot who she was talking to due to the disturbance. {*Tom* and Jim are learners' pseudonyms} Finally she called the entire class to attention in order to clarify the expectations.

{76} Teacher : *Jim* where are you going? (talking to another learner this time) Have you done 1.3? *Tom* have you done 1.3?

{77} *Tom* : Yes!

{78} Teacher : Ok in 1.4, the answer that you got in 1.3 must be converted to kilolitres. I am talking about.... *Tom*, ***ke mang...***? I'm talking about 1.4 not 1.3, please. Ok, attention 1.4 what does the question say? Please don't just go straight to the answers make sure that you read the questions.

All the examples of code-switching showed in these extracts proved that in spite of both the learners' and the educators' denying that they do switch codes indeed code switching did occur. It may be said that code-switching was seldom. However, it was against the language-in-school policy which allowed only English and Afrikaans as the medium of instruction in the Ex-Model C Schools. The use of code-switching did bring about familiarity to the mathematical content and context. The teacher used this familiarity,

brought about by Setswana, to teach Mathematics. Though the code-switching encountered here did not clarify Mathematics concepts or procedures in Setswana but was used as a platform for learners to do so in English. This was done through maintaining order, correction, affirmation and clarity seeking. Barwell (2003) expanded about similar situations wherein he affirmed that the socio-economic aspects of the learners brought from their homes are significant to the learning process. Therefore without these familiar language characteristics the learning environment would probably not have been conducive for learning and teaching of ESL learners especially.

6.7 CONCLUSION

In this chapter I provided a complete discussion of my research study. The discussion undertook the format of explaining the data that was gathered from each research instrument that was used. The three data collecting instruments, that is, the questionnaires, the interviews, and the classroom observations were reported upon separately and later compared to find similarities and differences. This was for the purpose of triangulation and ensuring that reporting provided more evidence from different sources. In cases where evidence from different sources differed, justifications were given for the conclusions that were made. For example, though the teacher mentioned that she did not like code-switching, the classroom observation evidence revealed, at times she did speak Setswana in order to achieve her lesson objectives.

It was interesting to note that generally the data collected pointed to the language dynamics that had been ignored, especially in terms of how language was used to teach Mathematics, for example, through repetition (re-voicing), use of artifacts and code switching (Moschkovich, 1996). These were used very subtly and discretely, and could have easily gone unnoticed. Such practices as these happened probably due to the fact that the people involved, that is, the learners and the teacher, were both second language speakers of English. Also, the use of contextualised examples pointed towards common socio-cultural aspects of learning and teaching, directly taken from the learners' actual backgrounds and used in order to facilitate understanding. This evidence was also seen in

the use of artifacts, personalized examples, etc., as discussed in this chapter with supporting extracts. Barwell (2003) confirmed that learning occurs when one's socio-cultural context is acknowledged.

Common views about how policy was seen to be privileging other languages were clearly witnessed through the continuous usage of English. English was also perceived as a neutral language and hence a fair choice to all the speakers of about ten African languages. What was also interesting was that educators could not stop learners from talking in their African languages while discussing their work. However, it is of great concern that these languages were not acknowledged in the language policy of the school, while their usage in facilitating learning proved worthwhile. Setati (2002) spoke of how African languages were used for seemingly insignificant tasks and as a language of solidarity. It was this solidarity that made the Ex-Model C environment more familiar and acceptable for learning and teaching for the ESL learners, without which learning would not have been better facilitated.

It must also be mentioned that the data showed conflicting views of learners. While the questionnaires showed that learners would prefer code switching, the interview data showed that they would not prefer it due to the lack of registers. What is however interesting is the fact that classroom observations showed that other languages were used to learn Mathematics. Therefore it must be acknowledged that the use of code-switching in the lessons was more evidenced when learners discussed their work which unfortunately the teacher did not allow during the lessons that were captured. This is because she was more talkative and learners had to follow each lesson step by step as she commanded without giving them enough time to discuss their thought processes and let alone to express themselves in their own manner. As evident from the extracts, line 69 - 71, she did not even answer the learners' questions which were asked in Setswana. She portrayed a teacher-centred teaching method.

Finally, it should be admitted that code-switching did occur irrespective of whether it involved learning mathematical concepts or not. Hence the functions for code-switching

were for seemingly insignificant tasks, for example, maintaining order, seeking clarity, etc. as listed in this chapter. Also the intentions of policy in shaping learning and teaching that benefits the ESL learners were almost insignificant since the educator was trying to abide by the language policy of the school, but ended up complying with the constitution of the country by using other languages unintentionally. These were seen to be in conflict with one another as reflected in the classroom observations.

This chapter provided most of the answers to the research questions, such as how the languages were used and for what purpose which referred to the language practices and the patterns observed. These occurred several times and hence offer convincing proof that they indeed exist. This is regarding the usage of African languages, their diversity and how these could be used for learning.. Though these languages could have made more contributions to learning of Mathematics, the preference for social goods (Gee, 1995) which only English could provide emerged a winner. Hence it would not be convincing to suggest that language policies of Ex-Model C schools should be altered since learners, teachers and parents are indeed happy with English and Afrikaans. The language diversities were evident and did result in the facilitation of learning. In the next chapter of conclusions and recommendations I will summarize the main findings and what could possibly assist the educators, parents and ESL learners of Ex-Model C schools, based on what this report has revealed.

Chapter Seven:

CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

In this chapter I present a conclusion to the main findings that were discussed in the previous chapters. The findings subsequently resulted in certain recommendations that will be made in this chapter. These include the use of African languages, parental and language roles and how learners might cope with language use at Ex-Model C Schools. I conclude this chapter by discussing recommendations, suggestions for further research and shortcomings of this study.

7.2 THE USE OF AFRICAN LANGUAGES

In this chapter I highlight the main findings that were discussed in Chapter 6, the discussion chapter. I have also included deductions and inferences that could serve as recommendations for both teachers and parents in trying to assist their children. These insights are not limited to those in the Ex-Model C classrooms but could provide interesting perspectives for those involved in similar settings such as other researchers, facilitators and other interested individuals.

One of the findings was that learners acknowledged the importance of African languages but were unable to see the usefulness to learning Mathematics in an African language. Furthermore, in spite of learners admitting that they did switch languages, that is code-switching, from English to African languages in cases where they did not understand English, their attitude towards the formal use of African languages for learning Mathematics remained negative. It was evident therefore that learning or discussing Mathematics using an African language somehow did assist the learners, especially for contextual mathematical problems and even for better understanding of what was required of them.

The evidence gathered during classroom observations revealed that both the learners and the teacher did switch language codes. Hence the conclusion that was drawn from this evidence was the fact that during the actual learning encounters, that is, classroom observations, language dynamics existed in the form of code-switching from English to an African language. This confirmed the findings by Adler (2001), in her study undertaken in Mohlakeng in which a teacher refused to use African languages though the video evidence showed learners using an African language. This practice seemingly denied the learners an opportunity to learn better had their teacher formally acknowledged the use of other languages. In answering the second part of my research aims, the language diversity that existed in this Ex-Model C classroom was not directly used by the teacher as a language resource for learning or teaching Mathematics. However, the learners did speak in their African languages and even the educator unintentionally or partly did use it by speaking in Setswana.

African languages were used for seemingly insignificant tasks during the learning encounters such as maintaining classroom discipline, while only English was used for learning and teaching. Once again this confirmed the findings by Setati (2001) in which Setswana was used as a language of solidarity and for maintaining order. In my opinion maintaining discipline is part and parcel of teaching and learning without which little or no effective teaching or learning could take place. Barwell (2003) pointed out socio-cultural factors, which assisted the classroom environment, by making it familiar and conducive for learning. The use of a familiar cultural language is a major part of maintaining discipline because learners' home backgrounds are then transposed onto the classroom.

7.3 PURPOSES FOR USING AFRICAN LANGUAGES

It was noted in the preceding paragraph that African languages were used for less significant tasks rather than learning and teaching Mathematics. One of my research questions sought to investigate how the language diversities were used for learning

Mathematics and in this part of my discussion I summarize my findings and make certain recommendations as follows:

1. Maintaining order: the educator spoke in Setswana reprimanding a particular learner over undesirable behavior in order to maintain classroom discipline. It is recommended that African languages be used for teaching certain aspects of Mathematics where registers have been developed, and not just maintaining discipline.
2. Correcting mistakes: after a learner has uttered an incorrect statement, the teacher tried to correct him by saying "...nna ke go bulelets..." which meant, "did I not tell you?" It is recommended that when the teacher code-switches to an African language she does so consistently, for the learners to know and remember what was said by the teacher and to articulate it in their own understanding (Barwell, 2003).
3. Affirmations: The educator was quoted as saying "a kere?" which means: "Isn't it?" This utterance is a rhetorical question affirming/confirming to the learners that the answer given is indeed correct. This is a useful strategy in building learner confidence (Lave and Wenger, 1991). In the case of ESL learners, this practice is valuable and recommended in order to boost learners' confidence not only in themselves but both in learning Mathematics and English.
4. Clarity seeking: the teacher asked a learner a question and in order to seek more clarity the learner asked in Setswana, "*Efing?*" which means: "*Which one?*" Here the learner was not following and needed to understand exactly which question to read. It is recommended that if the educator knows the majority language of the learners s/he would assist learners greatly if s/he code-switched to ensure that learners know exactly what they are supposed to do, else they will be left confused due to not understanding the English language.
5. Expressing frustrations: the teacher's frustrations were expressed by the phrase "...I am talking about.... *Tom, ke mang...*? I 'm talking about 1.4 not 1.3...". The Setswana language utterance "...ke mang..." means "who is it?" while referring to *Tom* (a pseudonym for a pupil) and this implied that for a moment

she forgot who she was talking to due to the disturbance she experienced. Finally she called the entire class to attention in order to clarify her expectations. Setati (2001) identified the use of African languages for solidarity. It would have been more appropriate for the teacher to also use this opportunity to transfer African values of respect, human dignity, etc., in order to appeal to the learners' s socio-economic background.

7.4 PARENTAL ROLE IN LANGUAGE PREFERENCES

The evidence showed clearly that it was the parents who were responsible for sending their children to the Ex-Model C Schools so as to be taught in the English language. Furthermore, in Table 10 Question 5, the educator confessed that the parents were indeed happy when their children spoke good English. This confirmed the views expressed by Setati (2003) and Gee (2001) in which parents preferred to purchase the social goods which only English provided. Though there might be nothing wrong in learning the English language, this should not be done at the expense of others. It would be recommended that other languages be promoted to the status English as stipulated in the country's constitution and LiEP, SASA(1996).

In table 2 Question 6 parents felt strongly that a low proficiency in English did not translate into poor performance in Mathematics, a view shared by Pirie (1995). Hence the knowledge of Mathematics could somehow be independent of the proficiency in English. It is therefore surprising that parents still preferred English for the teaching and learning of Mathematics to their children. It is recommended that code-switching be continued as long as it would benefit some learners to learn Mathematics better as noted by Moschkovich (1999) in the situated model of learning that learning can be situated even in other languages found in the classroom other than the medium of instruction.

7.5 THE INVISIBLE ROLE OF THE LANGUAGE-IN-EDUCATION POLICY

The parents verified that all languages were indeed equal and should all be treated with such understanding. This is according to the South African Schools Act in conjunction with the Bill of Rights (SASA, 1996). However, the parents agreed that their school's language policy favored certain languages. This is probably due to the fact that it not affect their learners learning in English.

Learners were not made aware about the language policy that affected their learning and teaching. This is probably due to the fact that they preferred English for learning and teaching. However, seeing that challenges of language dynamics arose, it is recommended that their socio-cultural backgrounds, of the lack of English, as Barwell (2003) explained, be accommodated to facilitate learning and teaching.

One of the other interesting conclusions was that English was used as a lingua franca, which meant that it was regarded as a shared language for purposes of fairness. What is strikingly odd about this view is that the educator was not aware that doing so led to the promotion of the English language. It would be interesting to find out since the educator said she was implementing the school's language policy, how it is that one language was promoted over 10 others. Sadly therefore the influence of the LiEP became invisible.

7.6 THE EX-MODEL C STATUS – A NEW COMMUNITY

The use of English at Ex-Model C Schools is part and parcel of their status of being referred to as "better schools". Lave and Wenger (1991) explained that the formation of learners' new identities are an important aspect for belonging to a new community. It follows that if these schools use African languages as in township schools, they might lose their identity and sense of worth and so will the learners who attend them. Hence this is one of the language dynamics that learners have had to deal with. It also confirmed

that Ex-Model C learners were developing self-repertoires needful to succeed in a new environment with new language and conceptual demands.

It is in this light that a new community emerging from Ex-Model C is confirmed. Lave and Wenger's (1991) activity theory assisted the researcher in investigating how learners would not lose their self-identities as the new environment experienced at school might be different to the one they assume at home or townships.

7.7 LEARNING METHODS DEVELOPED - TO COPE WITH LANGUAGE CHALLENGES IN EX-MODEL C SCHOOLS

In further answering the second part of the research question, which sought to investigate how languages were used for learning in Ex-Model C schools, and subsequently whether new forms of learning could thus emerge in dealing with these challenges, the following summarizes the teaching methods, which were confirmed in this study:

1. Rephrasing: rephrasing for the learners what was the expected manner of answering the question.
2. Answering methods: learners have to be taught to develop a tendency of answering a question in an acceptable manner.
3. Learning of English with Mathematics simultaneously: the use of proper English language in terms of grammatical correctness.
4. Coaching: learners have to listen and follow strictly what the teacher wants them to do in order to proceed to the next step. However such strict control may stifle self discovery by learners.
5. Continuous repetition: the use of repetition as a teaching strategy for consolidating what has been learnt by the learners.

6. Leading questioning: the use of learners' answers as a lead for more probing and insightful questioning for learners to understand and build confidence in what they had learnt.
7. Motivational teaching/affirmations: in applying Wenger's theory, learners who might have not developed language expertise would need to build up their self esteem in order to affirm themselves and extrinsic motivation may proved to be very useful.
8. Checking the final answer: Mathematics it is not about getting the correct answer but that there is something about the answer that can also be verified. Ending up at the answer without asking whether it makes sense or not, or even check and recheck the procedure followed in getting the solution is not enough.
9. Probing: if the answer to a question is answered incorrectly it would be beneficial to the learners' if more probing by asking further questions is done.
10. Contextual examples: the use of a counter example to show what was mathematically appropriate or not is also recommended.
11. Illustrations: the use of examples to illustrate what needed to be done.
12. Methodologies: a more clear method of what the learners ought to have done.
13. Alternate familiar context: the use of more familiar context for providing more explanation.
14. Modeling: In the journey of developing repertoires (Lave and Wenger, 1991), modeling coupled with mentoring became useful tools in order to assist learners deal with learning challenges.

7.8 SHORTCOMINGS OF THIS RESEARCH STUDY

Though this study was fruitful in unearthing teaching methods needed for Ex-Model C learners, there are five clear shortcomings of this study that I would like to conclude with:

1) This was a case study in which observations were made about language dynamics in Ex-Model C High Schools. Hence the study was situated in Ex-Model C High Schools and may not be generalisable to other schools, though one can learn from the experiences encountered here especially those in similar settings.

2) There are deeper issues that are causal to the language dynamics resident in the Ex-Model C schools and these were not discussed in this study, and hence the depth of the study was limited and restricted to the issues as discussed. The following areas are among the limitations of this research, and possibly for further research: the reasons why learners leave township schools, parents' inactivity in their learner's education, more language practices and discourses, development of registers, etc.

3) The literature that is available for studies undertaken in Ex-Model C Schools is very limited. While the phenomenon of Ex-Model Schools continues, Ex-Model C educators are left without assistance for their teaching and learning environments. This study sought to add to such studies.

7.9 SUGGESTIONS FOR FURTHER RESEARCH

Following from the limitations as explained above, the following aspects for further research emanated from this particular study:

1. A more in-depth knowledge concerning the parents' refusal to have their children learn in African languages in spite of the fact that all languages are equal.
2. What are the reasons for the educators teaching in Ex-Model C Schools for not code-switching in order to assist their learners learn better? Is code-switching part of the solution for Ex-Model C ESL learners?
3. What are the challenges faced with language policy implications? For example, the LIEP was a well-formulated policy but was unable to bring clear intentions that could assist SGB's articulate their language-in-school policies.
4. What methods could be implemented to assist African learners learn English before entering Ex-Model C Schools? Is it the extra English period or the promotion of learning mathematics in an African language?

7.10 CONCLUDING REMARKS

This chapter looked at the main findings and made significant summaries of the discussions and the inferences that were made. Recommendations and confirmations from similar studies were also acknowledged with a view to address the language dynamics in the Ex-Model C Schools. These emanated from the actual scenarios that unfolded during the analysis of the data. The shortcomings and suggestions for further research were also discussed.

TABLES

TABLES

TABLE 1

SCHOOL 1

LEARNER QUESTIONNAIRE

LEARNERS QUESTIONNAIRE ANALYSIS

HS JAN DE KLERK

	1	2	3	4	5		
	Strongly Disagree	Disagree	Not sure	Agree	Strongly agree	Mean	
1. Mathematics is better understood in English than in any other language.	0	2	1	9	19	4	Agree
2. African languages are just as important as English is.	1	3	2	15	9	4	Agree
3. African languages are not useful in learning Mathematics.	5	1	14	10	3	3	Ns
4. Mathematics would be much easier if it was tough in my African language.	9	10	7	3	2	2	Disagree
5. Besides English, learners are also allowed to speak in any other language in class.	2	1	7	11	10	4	Agree
6. By not understanding English, a person will not understand Mathematics.	5	4	11	4	7	3	Ns
7. Parents are responsible for the schools their children attend.	1	3	2	8	18	4	Agree
8. The Constitution does allow for all languages to be treated equally.	0	2	6	10	12	4	Agree
9. The school language policy favors certain languages for teaching and learning.	2	1	8	12	6	3	Ns
10. Parents prefer their children to be taught in English.	0	0	1	14	16	4	Agree

TABLE 2

SCHOOL 1

PARENTS

PARENTS QUESTIONNAIRE ANALYSIS

HS JAN DE KLERK

	1	2	3	4	5		
	Strongly Disagree	Disagree	Not sure	Agree	Strongl y agree	Mean	
1. Mathematics is better understood in English than in any other language.	1	1	1	5	26	4	Agree
2. African languages are just as important as English is.	0	1	4	11	20	4	Agree
3. African languages are not useful in learning Mathematics.	7	3	12	4	9	3	Ns
4. Mathematics would be much easier if it was tough in my African language.	4	11	11	7	2	3	Ns
5. Besides English, learners are also allowed to speak in any other language in class.	1	3	5	16	9	4	Agree
6. By not understanding English, a person will not understand Mathematics.	7	11	9	5	2	2	Disagree
7. Parents are responsible for the schools their children attend.	3	4	9	9	9	3	Ns
8. The Constitution does allow for all languages to be treated equally.	0	0	2	11	21	4	Agree
9. The school language policy favors certain languages for teaching and learning.	2	0	7	13	12	4	Agree
10. Parents prefer their children to be taught in English.	0	0	11	16	7	4	Agree

TABLE 3

SCHOOL 2 (RNF)

LEARNERS

LEARNERS QUESTIONNAIRE ANALYSIS			RANDFONTEI N SECONDARY				
	1	2	3	4	5		
	Strongly Disagree	Disagree	Not sure	Agree	Strongly agree	mean	
1. Mathematics is better understood in English than in any other language.	0	0	1	2	8	5	Agree
2. African languages are just as important as English is.	0	2	3	2	4	4	Agree
3. African languages are not useful in learning Mathematics.	0	2	5	1	1	3	NS
4. Mathematics would be much easier if it was tough in my African language.	5	3	3	0	0	2	Disagree
5. Besides English, learners are also allowed to speak in any other language in class.	2	2	1	4	2	3	Agree
6. By not understanding English, a person will not understand Mathematics.	1	3	3	1	3	3	Ns
7. Parents are responsible for the schools their children attend.	0	0	0	4	7	5	Agree
8. The Constitution does allow for all languages to be treated equally.	2	0	2	3	4	4	Agree
9. The school language policy favors certain languages for teaching and learning.	0	0	5	4	2	4	Agree
10. Parents prefer their children to be taught in English.	0	0	1	3	7	5	Agree

TABLE 4

SCHOOL 2

PARENTS

PARENTS QUESTIONNAIRE ANALYSIS			RANDFONTEI N SECONDARY				
	1	2	3	4	5		
	Strongly Disagree	Disagr ee	Not sure	Agree	Strongly agree	Mean	
1. Mathematics is better understood in English than in any other language.	0	0	0	3	11	5	Agree
2. African languages are just as important as English is.	0	1	1	6	6	4	Agree
3. African languages are not useful in learning Mathematics.	1	5	4	0	3	3	Ns
4. Mathematics would be much easier if it was tough in my African language.	3	7	3	1	0	2	Disagree
5. Besides English, learners are also allowed to speak in any other language in class.	1	4	2	5	2	3	Ns
6. By not understanding English, a person will not understand Mathematics.	4	5	3	2	0	2	Disagree
7. Parents are responsible for the schools their children attend.	1	2	4	4	2	3	Ns
8. The Constitution does allow for all languages to be treated equally.	0	0	1	3	10	5	Agree
9. The school language policy favors certain languages for teaching and learning.	0	0	3	6	5	4	Agree
10. Parents prefer their children to be taught in English.	1	2	2	8	1	3	Ns

TABLE 5**SCHOOL 3 (TVS)****LEARNERS**

		1	2	3	4	5		
		Strongly Disagree	Disagree	Not sure	Agree	Strongly agree		
1	1. Mathematics is better understood in English than in any other language.	1	0	3	14	16	5	Agree
2	2. African languages are just as important as English is.	11	3	6	7	9	4	Agree
3	3. African languages are not useful in learning Mathematics.	5	2	15	7	1	3	Ns
4	4. Mathematics would be much easier if it was tough in my African language.	8	7	11	2	0	2	Disagree
5	5. Besides English, learners are also allowed to speak in any other language in class.	2	2	2	12	10	4	Agree
6	6. By not understanding English, a person will not understand Mathematics.	3	9	6	4	6	3	Ns
7	7. Parents are responsible for the schools their children attend.	1	0	1	8	18	5	Agree
8	8. The Constitution does allow for all languages to be treated equally.	3	1	8	8	9	4	Agree
9	9. The school language policy favors certain languages for teaching and learning.	3	1	11	8	6	3	Ns
10	10. Parents prefer their children to be taught in English.	0	1	3	6	19	4	Agree

TABLE 6

SCHOOL 3

PARENTS

PARENTS QUESTIONNAIRE ANALYSIS			TOWNVIEW HIGH SCHOOL				
	1	2	3	4	5		
	Strongly Disagree	Disagree	Not sure	Agree	Strongly agree		
1. Mathematics is better understood in English than in any other language.	0	0	1	6	22	4	Agree
2. African languages are just as important as English is.	0	0	1	12	17	4	Agree
3. African languages are not useful in learning Mathematics.	8	4	12	3	4	3	
4. Mathematics would be much easier if it was tough in my African language.	7	5	13	4	1	2	Not sure
5. Besides English, learners are also allowed to speak in any other language in class.	1	2	9	8	11	4	Agree
6. By not understanding English, a person will not understand Mathematics.	6	11	4	3	7	3	Disagree
7. Parents are responsible for the schools their children attend.	6	5	8	5	9	3	Agree
8. The Constitution does allow for all languages to be treated equally.	1	2	0	11	16	4	Agree
9. The school language policy favors certain languages for teaching and learning.	0	4	4	9	13	4	Agree
10. Parents prefer their children to be taught in English.	0	4	8	6	11	4	Agree

TABLE 7

OPEN SECTION OF THE QUESTIONNAIRE

SCHOOL 1

LEARNERS' VIEWS

Questions	Responses	Analysis
1. Lists the languages that you can understand and speak.	English (27), Afrikaans (9), Sotho(6), Venda(1) and Tsonga(1), Setswana(27), Sepedi(3) Xhosa(8) Swati(1), Zulu (13), Ndebele(1)	In the data that is presented it becomes clear that there are language differences in this Ex-Model C class, and in fact all the eleven official languages are represented. All 27 learners understand English and Setswana as well other African languages in addition.
3. Which language is most spoken in your classroom?	English (23), Setswana (13), Zulu (1)	English is seen to be most dominating language spoken during teaching and learning as during normal conversations.
5. Which language would you prefer when solving Mathematics questions in a test?	English (33) Setswana = 2	English is the most preferred language for the learning and solving of Mathematics problems during assessments at the school. It is interesting that 2 learners, for some reason, prefer Setswana to be used for answering Mathematics questions in a test.
7. Are you able to freely express yourself in your vernacular during your Maths lessons, especially when you do not understand? Explain.	Yes (15) = in cases where they cannot express themselves in English (7) Talking to the educator (4) No (7) = English is easy (5)	The majority of the learners (15) speak their vernacular during Maths lessons when they do not understand English, and some do so when talking to the teacher. It is interesting to note that 7 learners do not seem to speak African languages at all in preference to English.

		This view agrees with the results from the Lickert scale part of the questionnaire in which both the parents and the learners agree that learners are not forbidden to speak their African languages during their Mathematics classes. What is also of more importance is the fact that doing so is helpful to their understanding of Mathematics since in the Lickert scale parents felt that by not understanding English it does not mean one cannot understand mathematics.
8. A friend of yours struggles to understand the English language in a Mathematics problem. Explain what you could do to assist?	Explain in her language (26). 26/33 {language as a barrier to solving mathematics problems}	The majority of the learners (26) admit that switching to another language is a possible solution to the lack of understanding.
9. Would you be comfortable if in your class your Mathematics teacher explains the Mathematics problem in English and in your vernacular as well as well?	“Yes” 15 = comfortable, in order to assist the understanding of mathematics(6). No supporting reason (8) “No” (5) = might not help, but only confuse (3)	Most learners (15/27) are comfortable with switching of languages to help understand Mathematics better. While still a few (5) do not feel that this might help.

TABLE 8**PARENTS' VIEWS**
SCHOOL 1**Open-ended questions**

Questions	Responses	Analysis
1. Lists the languages that you can understand and speak.	English(29) Afrikaans (13) Sotho (5) Setswana (19) Xhosa (5) Sepedi (2) Venda(2), Ndebele(2) Zulu (6)	Most (29) parents understand English. However, Setswana is the most dominating African language spoken by the parents.
3. Do all the languages enjoy equal status in your child's class? Why?	'No' (15) = because the language of teaching and learning is English alone, and to accommodate others only English is used. (7) = no reason (7) "yes" (9) = communicate with each other(4) there are different languages (2)	The majority (15) of the parents feel that not all languages enjoy equal status and the most reason they gave is that English is used frequently for learning and teaching, as this accommodates all learners.
4. Which language would you prefer your child to learn Mathematics with at school?	English (32) Tshivenda (1)	Most of the parents prefer English for teaching and learning of Mathematics.
7. Would you allow your child to learn Mathematics in his/her mother tongue if given an opportunity to do so? Why?	"No" (22) = It is an English school (1) English is better, easier, because other children might not understand (8) the mathematics better in English, challenges for future, tertiary education (3) "Yes" (7) = (3) no reason they will understand better (2) All languages are equal (1)	The majority of the parents would not prefer mother tongue for teaching mathematics at the school. Surprisingly though 7 parents would allow their learners to learn mathematics in their mother tongue if given a chance.
10. Would you be	"Yes" (16) = due to the lack of	Parents would be fine

comfortable if in your child's Mathematics classroom the teacher explains the Mathematics problem in English and in your child's mother tongue as well? Why?	English, it will assist with understanding. "No" (6) = teachers might need more time(1), she might not even know other languages(1) prefers English only (2)	with code switching in order to assist learners learn Mathematics better.
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TABLE 9**INTERVIEWS****SCHOOL 1****LEARNERS**

Questions	L1 - response	L2 - response	L3 - response	Analysis
1. Do you think all the languages enjoy equal status in your classroom? Why?	1. Yah I think so. It's the same because in any language is gonna do with this they still going to understand this ..e.. they 're still going to get the point of the thing that the teacher is trying to explain. They gonna do like	1. Yes sir I think so. (<i>why</i>) Sir sometimes according to the class I do not understand where the teacher explains in English so he or she will ask a friend to at least explain in some other language for him or to understand better.	1. OK what I 've noticed is that although it's an Afrikaans school, and we are supposed to speak English in our classes, most of the kids speak in like African Languages nobody care about them that much	During interviews, learners stated that all languages are treated equally in their classes even though English seems to be dominating. While at the same time the use of other languages could not be stopped.
2. Are you able to freely express yourself in your vernacular during your Mathematics lessons? Explain.	2. Definitely no! I can't. (explain). Because of the..., they way....like the numbers, like, ungwe, pedi, tharu, I wouldn't, I don't know, I wouldn't go up to ten. That is to say I wouldn't go up to twenty seven, twenty eight,... I	No, sir. For me it's hard, cause I never spoke vernacular so when it comes to say...like, I cannot say in a different way. It's not what I, it's not my own doing that.	Yah I do, our teacher is OK with it. There is no problem with it.	Learners have become more accustomed to the use of English and in fact have forgotten how to say certain words in their vernaculars. Though from the questionnaires, learners were fine with using other languages (African in this case) if they could not

	wouldn't be able to do that in my language.			understand English, but the evidence from the interviews reveal the opposite. This is particularly due to the lack of registers from the African languages needed to do mathematics and the translation from one language to the other.
3. When do you use your mother tongue in your Mathematics class?	C1. If I can,...If I am helping another person If I can see that they do not know or they do not understand properly in English, then I 'll try and explain in another language.	. I use it when, maybe a lot of times I use it when I speak to someone who doesn't understand English. But other than that we love talking in English.	C1. Uhm. Ok I use it when I am tired of speaking English. cause sometimes I do get tired when everybody is speaking Tswana, and I am like it's OK now I am going to speak Tswana.	African languages are helpful to explain to learners who are not completely conversant with English.
4. Are you aware that the South African constitutions allows for the equal practices of all languages?	No I wasn't aware of it.	C2. I wasn't aware. I thought that maybe all children understand English...so...so what.. I thought that. To me it seems like English for a lot of children outside there if	C2. Oh, I honestly didn't know that. I didn't know. I just think we are suppose to speak English because it's an English school.	Learners are not aware of what informs certain language practices at their school.

		you call him or her and you talk to him or her in English he or she will understand.		
5. Is this stipulated in the language policy of the school? Have you been made aware by the SGB?	D2. No	D2 No. Wow! (very much surprised) I never, I never checked something like this.	D2. Uhm I 'd say no. Because it's an Afrikaans and English school. Not really. But I think that it's something that we all know.	The language policy of the school has not been clearly understood by the learners or even brought to them to be educated. In spite of the presence of other languages in these schools it seems that their language policy have not changed to accommodate the majority of the learners who speak African/other languages.
6. Would you be comfortable if in your class your Mathematics teacher explains the Mathematics problem in English and in your vernacular as well as well?	Yah. I will be comfortable. Sometimes there're some things that in English you won't get as much as in your vernacular language, so, I would rather sometimes have them to ... the numbers I would like them in	No. no. (why, explain) Sir if a teacher explains in Maths. I would like her, him or her to explain in a particular way in English, but in others, cause sometimes, when somebody starts, especially when the teachers speaks vernacular, some other children are going to take as if, ok now, she is	No. I prefer the teacher does it in English because it's going to confuse us if she is switching languages all the time. Because it's only easier when you speak one language. Then you could get	Even though one learner would not mind to do mathematics in an African language he expressed a difficulty of having to say numbers in such a language. While clearly the other learners prefer English because it is easier and would avoid any possible

	English but the explanation in the mother language.	saying this and then we can all say it. And then it's gonna be a ...trouble.	more, that is what I think.	confusion. Hence consistency in using one language is viewed to have more benefits than switching languages.
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TABLE 10

INTERVIEWS
SCHOOL 1
TEACHER'S VIEWS

Questions	Responses	Analysis
1. What is main your main language?	1.a. I don't. understand when you say main language. My mother tongue is Setswana. But where I am working the medium of instruction is English and Afrikaans,..... I am doing all my classes in English.	The educator fully understands the language policy of the school and is aware that at this school only English and Afrikaans could be used for learning and teaching.
2. Which language do you use as your medium of instruction?	English	The educator prefers to teach in English even though it is not her main language and this does not seem to concern her in spite of the fact that the majority of the learners she teaches are also ESL speakers, whom the majority speak and understand her main language, Setswana.
3. Do all the languages enjoy equal status in your classroom? Why?	d. I think they do all enjoy, more especially when using English. Because I think English is the simplest language whereby all learners understand. It's the only easiest language. <i>(Are you saying that because the learners can also say in their own languages?)</i> They can talk in their own language but it's difficult, I'm a Setswana speaking person, but it will be very difficult to teach Maths in my own language because even to myself it is very tough. Because even if you go to the schools whereby they are using Setswana or Xhosa or whatever, as a medium of instruction, but when it comes to Maths they always use English.	It is clearly evident that the educator prefers the use of English for teaching mathematics. This is captured in her assertions that "It is the only easiest language."

4. In your opinion is this policy in line with the language-in-school policy? Please elaborate.	f.2. I think... yes it is. Because most of the, we are not speaking the same language here, there are the Xhosas, the Zulus and whatever. And the only language that I understand up to this point is Afrikaans, English and Setswana. Because I am using English, which is the medium of instruction that is why even the Xhosas, the Zulus, and what ever, those doesn't know Setswana can understand.	As expressed in the questionnaires that English is the preferred solution to language diversity, a similar view is witnessed in this response by the educator. Further more, the challenges that a teacher would experienced when trying to switch codes to many other languages have been captured due to many diverse languages.
5. Would you say that the parents are happy with this language as the language of learning and teaching?	I think they're happy. I think they are happy. Because they.... according to my own opinion I am a parent too, because I understand English, I work with the kids from different languages but only to find that I have seen that even though the are using different mother tongues but when it comes to English they always, they all understand. That is why I am saying maybe even the parents are happy because I didn't have a problem whereby we are having a problems whereby the (teachers) parents were saying please this kid of mine is not using English at home why are you preferring to teach her in English, why can't you teach her in a mother tongue. Yes they are happy.	The educator highlights the parents' expectations for their children to learn in English since teaching them in other languages could pose conflict of interests for their children. Once again the educator does not forbid (cannot stop) learners from using their African languages. They seem to have accepted that learning and teaching of mathematics occurs is in English.
6. Would you be comfortable in your class to explain the Mathematics concepts or problems in English and in the majority language (African) spoken by your class? Why, or why not?	g. I won't be comfortable. Because I may start with my mother language, its Setswana, it's tough, is very tough. Even myself won't be able to express everything in Setswana because some of the words we are having the Tswana name for them but we just call them in English, more especially when it comes to	The educator honestly confirms that switching codes and using all other languages will not be possible. The shortage of registers is also a serious challenge when teaching in African languages. The dominant use of English is seemingly invincible since even the children from an early age

	the numbers. When, OK let me count for you from number one up to number five, in English it's one, two three, four, five. Even if you can go to the young lady, the baby who is five years old will count to you, she will say one, two, three, four, five, but when it comes to the mother tongue, Setswana, it's ungwe, pedi, tharu, nne, tlhanu. Even when I am at home, I am speaking Tswana at home, but if I want somebody to go to the shop to buy the oranges I need five of them I'll never say to him go and buy dinaume dilithlanu I always say tsamaya u reke dinamune dili five.	start counting in English than in their mother tongue, and counting in their mother tongue is very difficult when compared to English.
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TABLE 11**EXPLICIT ANALYSIS**

<u>CATEGORY</u>	<u>INDICATORS</u>	<u>DEFINITION</u>
1. CODE-SWITCHING	Code-mixing	Code-mixing refers to any admixture of linguistic elements of two or more languages. Some languages are more dominant, through their frequent use and availability of mathematics registers, such as English, and hence other languages adopt most of their words.
	Code borrowing	It is when a sentence uses words that are taken from other languages but are used as though they are natural words of the language. For, example, the word “penseli” is an English word but it has been used as if it is a normal Zulu word.
2. REVOICING	Interpretation	Explaining the same concept but using different words, to ensure that if there was a word or phrase that learners did not understand, a simpler and more understandable term is used.
	Translation	A translation as used in this research would take a form of using another language to express the same concept. This will be evident when, should a learner not understand the English explanation, an alternative one perhaps in Setswana could be used
	Re-explanation	To explain the same concept but in similar words, to ensure that even those learners who might not ask questions if they do not understand get a second, third or even fourth chance to access the mathematics being discussed
	Repetition	The repeat of a word, phrase or sentence by one, two or many individuals in order to affirm common understanding and achieve a common goal. A teacher may repeat to the class in order ensure they are following his/her instructions. Learners might repeat after a teacher and vice versa.
5. USE OF GESTURES	Body language	This is silent communication that results in a required behavior without the utterance of a word. It involves the use of hand signals, pointing and illustrating, facial expressions, or even demonstration, etc.
	Artifacts	The use of a familiar, or more contextualised setting in order to explain a more difficult, abstract and complicated mathematical scenario. It might involve using objects, experiments, etc.

TABLE 12**SCHOOL 1****CLASSROOM OBSERVATIONS**

THEMES	Transcript	
B. Re-voicing,		Common observed patterns/Analysis
Lesson 1	{8} Learner 2 (Steven) : (continues to read) ... if one week refers to seven day, and { one..... {9} Teacher : seven days ----- {11} Teacher : What is the question please.....? 1.1.1 {12} Learner (Steven) : Making tea... {13} Teacher : How much water is used to make tea once..? ----- {37} Teacher : R288. (learners talk in Setswana, mocking the one who gave the wrong answer) Therefore the first question is saying you are using 1, 2 kilos of water how many times a day? {38} One learner : 3 times {39} Teacher : 3 times a day. How many times per month? {40} Another learner : 3 times ----- {17} Teacher : Therefore how many days do you come to school? (she writes the responses on the board) : $5 \times 4 = 20$. {18} All learners : 20 days! {19} Teacher : Is it 20? {20} All learners : Yes! {21} Teacher : It's 20. Therefore if....	Learners answer, The teacher repeats with a correction in “days” Learners answer, The teacher repeats by making a complete acceptable English sentence Learners answer, The teacher repeats by adding “a day” Learners answer, The teacher repeats, by

	----- {26} All learners : 20 {27} Teacher : It's 20. Therefore, which means how much am I going to pay? This amount....(pointing to the answer of : $14 \times 5 \times 20 =$ _____). This one is the one that I paying per day. (pointing towards the answer). How many days per week? ----- {36} All learners : R288. {37} Teacher : R288. (learners talk in seTswana..... ----- {57} Teacher : Twice per week a kere? Therefore it's going to be 50 times... {58} All learners : 2 {59} Teacher : Is it times two? -----	asking and to probe further in order to build learners' confidence in the answer Teacher finally affirms their reasoning. Learners answer, The teacher repeats { further probing and questioning } Learners answer, The teacher repeats Learners answer, The teacher repeats by probing further their answer of "2"
Lesson 2	Transcript	Analysis
	{5} Teacher : What is the meaning of this song, because there is a saying that says: " action speaks louder than words," can any one read the first question for us? {6} Learner 2: (begins to read) {7} Teacher: Listen, listen, listen, listen..... Yes Steven... {8} Learner 2 (Steven) : (continues to read) ... if one week refers to seven day, and one..... {9} Teacher : seven days {10} Learner 2 (Steven) : and one month refers to 30 days,	{7} Repetition {8} – {9} Repetition {10} Interpretation

determine the estimated monthly water consumption for..... {11} Teacher : What is the question please.....? 1.1.1 {12} Learner (Steven) : Making tea... {13} Teacher : How much water is used to make tea once..? {14} Some learners : 1. 2 {15-6} Teacher:How many times do you come to school in this 30 days? It's going to be 5... how many days are there in a week? {16} All learners : 7/4 {17} Teacher : Therefore how many days do you come to school? (she writes the responses on the board) : $5 \times 4 = 20$. {18} All learners : 20 days! {19} Teacher : Is it 20? {20} All learners : Yes! {21} Teacher : It's 20. Therefore if you want to know how much are you going to be paying per month, you are going to say: you know that I am paying R 14 per day. What about per week? How many weeks? {22} All learners : 4 {23} Teacher : I am paying R14 per day. How many days am I coming to work per month? {24} All learners : 5 days {25} Teacher : Per month {26} All learners : 20 {27} Teacher : It's 20. Therefore, which means how much am I going to pay? This amount....(pointing to the answer of : $14 \times 5 \times 20 =$ _____). This one is the one that I paying per day. (pointing towards the answer). How many days per week?	{12} - {13} Repetition {17} Translation {17} – {19} Repetition {21} Interpretation {21} Repetition Contextualizing to relate to real life familiar contexts {26} – {27} Repetition and Interpretation Emulating {36} – {37} Repetition {36} – {37} Interpretation {38} – {40} Repetition
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	{28} All learners : 5 {36} All learners : R288. {37} Teacher : R288. (learners talk in Setswana, mocking the one who gave the wrong answer) Therefore the first question is saying you are using 1, 2 kilos of water how many times a day? {38} One learner : 3 times {39} Teacher : 3 times a day. How many times per month? {40} Another learner : 3 times {52} All learners : Eleven times {53} Teacher : per month? {54} All learners : 30 {55} Teacher : washing clothes? {56} All learners : twice per week {57} Teacher : Twice per week a kere? Therefore it's going to be 50 times... {58} All learners : 2 {59} Teacher : Is it times two? How many weeks are there in a month, are they two? {60} All learners : Oh 4 Teacher : Go on with your work please, let's give you 5 minutes to complete that work, then we'll report to question 1.2. Please! Make sure that you show all the calculations! Look at this one. (pointing to the board where had written to illustrate). {63} Teacher : Ok! Attention, attention... let me get the question in 1.1 Activity one. (she reads the question) “ If one week refers to 7 days.....” What will be the units for the answers that you are going to get? From 1.1.1 up to 1.1.5? What will be the units? Boitumelo?	{53}- {54} Interpretation/translation {56} – {57} Repetition Repetition in order to coerce the learners to agree: “akere” = “isn't it?” {58} – {59} Repetition, in order to probe further {63} Repetition {68} Interpretation – 30 days = 4 weeks
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	----- {67} All learners : 4 {68} Teacher : Therefore it means you are not going to say 30 days is going to be 4 weeks, because you are washing per week in a month, please, sharp-sharp, sharp-sharp ...then say thank you to me, say thank you... can we move on to 2.2. you are wasting time,.... Sorry...you are wasting time,....please you can't waste time {69} Teacher: Attention, we need to get the information so that we cannot stop writing. Attention, 2.2 let us read the question and then we go back to 2.1, let's read the question in 2.2, anyone who can read the question for us? Bongani, can you please read the question for us? {70} Bongani : Efing? ----- {71} Teacher : Show by calculation that Mr Molaka's family will be using more water than free 600 l of water given per one, to cover the basic needs.....listen care fully....., ok for 1.2 you are going to add all the litres of water that you have been calculating so that you can get the amount of water that has been used per month. For 1.2, in 1.1 you have been calculating how many litres must you use for making the tea, how many litres you have been using for washing, how many litreswhat else, for cooking, for bathing, for flashing. Therefore 1.2 says, show by calculating how much water is he going to use. How are you going to answer that question? By adding all the total of waters that are there. Add everything that is there. So that you can get the answer for 1.2. ----- {75} Teacher : If you don't know what the difference is please there are no keys there it's open, the toilets.... 1.3 will the difference between 6000 and the answer that you got in 1.2. 1.2 sum of all the answers that you got in 1.1. ----- {78} Teacher : Ok in 1.4, the answer that you got in 1.3 must be converted to kilolitres. I am talking about.... Bongane, ke mang...? I 'm talking about 1.4 not 1.3, please. Ok, attention 1.4 what does the question say? Please don't just go straight to the answers make sure that you read the questions before you start answering. 1.4 how much Mr, Mrs Moabelo's family pay for the excess water consumed in that month in 1 kilolitre cost if one kilolitre cost R3,40c. What will be the unit for 1.4? Stop writing.	{69} Repetition of instruction to drill procedural thinking according to what question demands. {71} Repetition {71} Interpretation/translation {71} Repetition {75} Repetition {78} re-explanation {78} Repetition of instruction to drill procedural thinking according to what
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	What will be the unit for 1.3, I mean 1.4? If you think you know the answer or if you want to try, just raise up your hand! Read question 1.4. Read question 1.4! What will be the unit for 1.4? We are going to hear Lerato..... {89} Teacher : Ok 1.3 you all can answer there... (pointing to the board) in 1.3. The first step in 1.4, you take the answer that is there in 1.3 convert it into kilolitres then you get there..(pointing to the step already done/written on the board)... multiply by 3,40 divide by kilolitre , the answer is there.. and for 1.4 they are saying answer rounded off into two decimal places, (talking directly to a learner) ... the question is there in a question paper is not there (point at her face/eyes). 1.4 answer rounded off to two decimal places. Why are they rounding the answer into two decimal places? Because you know that when you are dealing with money... because you know that when you are dealing with money you must always have two digits after a comma. So when you are rounding off to two digits, you look at the third number, if the third number is more than 5 you make it one adding to the second number after the comma, if the third number is lesser than 5 you make it zero add it to the second number after the comma, sharp.. sharp, then you can go on with your work. (putting the workbook on the table)	question demands {78} Repetition of two phrases {89} Repetition {89} interpretation/translation
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A. Code-switching	Transcript	Analysis
Lesson 1	{1} Teacher : (Hands out learners workbooks, calling each learner by name to come and collect from the front. One learner decides to take for others sitting at the back, and the teacher spoke in Tswana trying to stop her and she responded in Tswana that she did this for those sitting at the far back of the class.... “ ... ke tla ditlisa ko morago....” {2} Teacher: (reprimanding a learner in the front group in Tswana, speaking in a low voice) “Bona...”	{1} – {2}Code switching in order to gain classroom management

	{47} Teacher : 30 times, that's what you will calculate the amount of water that you are going to use for tea it is going to be 1, 2 times...? {48} Steven: times seven (utters an incorrect answer) {49} Teacher : it's sleepy (speaking in another language"...nna ke go buleletsi..) Is it times 7? ... cause you are using it three times a day! ----- {55} Teacher : washing clothes? {56} All learners : twice per week {57} Teacher : Twice per week <i>a kere</i>? Therefore it's going to be 50 times... {58} All learners : 2 {59} Teacher : Is it times two? ----- {69} Teacher: Attention, we need to get the information so that we cannot stop writing. Attention, 2.2 let us read the question and then we go back to 2.1, let's read the question in 2.2, anyone who can read the question for us? Bongani, can you please read the question for us? {70} Bongani : <i>Efing</i>? {71} Teacher : Show by calculation that Mr Molaka's family will be using more water than free 600 l of water given per one, to cover the basic needs..... ----- {76} Teacher : Ofentse where are you going? (talking to another learner this time) Have you done 1.3? Steven have you done 1.3. {77} Steven : Yes! {78} Teacher : Ok in 1.4, the answer that you got in 1.3 must be converted to kilolitres. I am talking about.... Bongane, <i>ke mang</i>...? I 'm talking about 1.4 not 1.3, please. Ok, attention 1.4 what does the question say?	Code switching in order to stress attentiveness and hence resulting in correcting that which was wrong. Code switching in order to coerce learners to agree, also used as a language of solidarity. "Akere?"= "isn't it". The normal acceptable answer is always the one agreeing. {70} Code switching in order to gain clarity as the learner sought for help – none was given
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	Please don't just go straight to the answers make sure that you read the questions.	though: "Efing?" = "which one?" {78} Code switching in order to release frustration and maintain discipline. Spontaneous speaking in Setswana exposed the teacher to the fact that her main language in fact Setswana and teaching in English all the time was a bit uncomfortable at times and even frustration as she was overtaken by her moment of anger, as the learner was being ill-disciplined.
Lesson 2		
	Group 1: {11} L1 : Ayi nakhu ngicedile sengiya color. Ah yini, angiyitholi {12} L2 : Usebenze nge pen? {13} L 1 : Eh? {14} L 2 : Did you use a pen? To highlight this? {15} L 1 : Oh lez' abathi ngizenze eyi uyabonake nay eng shayayo mfana.	Use of another language - IsiZulu {learners are conversing in their languages in their groups to find ways to deal with how they had to do their work}

	{16} L 2: Nawe uyi shayele {17} L 1: Oh, ngisebenzise ipeni kulez' abathi ngizenze? {26} T : It's going to help you {27} L 2 : Yes Mam. {28} T : What are we doing there? {29} L 2 : ke tlatla ke drawe fela. {33} L 6: tswantse e shebe kwa {34} L 7: Akere it must be like that. {35} L 6 : E yalo a kere {36} All the others in the group agree: E e yalo {37} L 6 : E yalo, so ... e ke e {pointing at the sketch of lines} {38} L 7 : Then e ke e, {also pointing at the sketch of lines drawn} {39} L 8 : Le a bona, itswanetsi inne so {showing them the SA flag from a Constitution booklet} {40} L 6 : engwe inne fa inne wide.. {41} L 8 : bona gore flag e yang? {47} T : Transformation, listen, its either reduction of enlargement, so which one was that {46} L 9 : Reduction {49} T: {referring to a certain learner but speaking to the entire class} Le se ke la fojara, e tswane fela like this, ga u yi kryer ibe u e kryer go na yana. Please you must follow the steps, if you don't follow the steps your flag will never be correct. {50} T : Please! No mistakes!	Use of another language – IsiZulu (similar case) Language of solidarity and comfort Code-mixing, “ipeni” Use of another language – Setswana : lack of registers for the word “draw”: Code-mixing Use of another language – Setswana {artifacts and demonstration. {34 – 36} learners coercing one another and agreeing Code-mixing {37 – 39} Use of artifacts by the learners in their own languages of Setswana.
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	{51} L 10 : ... <i>enyane</i>....? {52} T : That <i>small mistake</i> that one.....! {she then moves around helping other learners} {53} L 7 : e ko dimo.... {54} L 6 : e e (no) eko dimo ga, ga e.... {55} L 8 : Eya.... ----- {56} T : Attention again. {addressing the whole class} Attention! Please make sure that you can't draw and color at the same time. {57} Learners: Yes {58} T : Make sure that you draw everything, you highlight the lines that needs to be highlighted, you erase those that need to be erased then you start coloring, please you cannot draw and color at the same time. Lesedi you are going to make a big mistake. You have a pencil on ones side then on the other side you have a coloring pen. {59} L 11: {Lesedi, denying} ... no... {60} T: There it is, I am talking about this. {61} L11 : E, a ke se drawe {62} T : That is why I am saying, please make sure that you draw everything, after drawing you can start coloring. {63} T : {Referring to other learners who were seemingly cheating the activity} <i>Lona la fojar a la etsa ntho tse.. so... lafojara.</i> {she then moves around helping other learners} {64} T : {Talking to a learner } Highlight it, this one, is there any instruction that says erase it? {65} T : {Talking to the whole class} Please you cannot erase all the lines, in the step 7 is not highlighted, the line	Use of another language - Setswana Use of another language – Setswana. Code-mixing. Use of another language – Setswana and Afrikaans Interpretation from Setswana to English Use of another language - Setswana
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	number 7 must be highlighted first from there you erase. Please if your flag is deurmekaar I am going to mark you wrong and you lose 8 marks. -----	Code-mixing due to shortage of registers. Use of another language – Setswana. Code-mixing “forging” = “fojara” Use of another language – Setswana and Afrikaans. In order to maintain discipline for doing what is required. While at the same time venting out frustration.
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B. Use of gestures	Transcript	Analysis
Lesson 1	{14} Some learners : 1. 2 {15} Teacher : So listen to my example: I am paying R14 per day and I am paying that R14, 5 times a week but for a month 22 days, why are you saying 22 days, because I am coming to school 5 times a week, meaning Saturdays I am not coming to school. Therefore because... (interrupted by a learner who entered the class to talk to the teacher) ... ----- ---- {16} All learners : 7/4 {17} Teacher : Therefore how many days do you come to school? (she writes the responses on the board) : $5 \times 4 = 20$. {18} All learners : 20 days! ----- ---- {26} All learners : 20 {27} Teacher : It's 20. Therefore, which means <i>how much am I going to pay?</i> This amount....(pointing to the answer of : $14 \times 5 \times 20 = \underline{\hspace{2cm}}$). This one is the one that I paying per day. (pointing towards the answer). How many days per week? {28} All learners : 5 {29} Teacher : How many weeks per month? ----- ---- {41} Teacher : We are using it everyday. The question	Use of example Emulates by showing on the board Uses a personalized/contextualized example and writes to illustrates on the board Uses a personalized/contextualized example

	says If one week refers to 7 days, but my week because I am coming to school it's Mon.....Fr. It's 5 days. Therefore it means that my days are going to be 5, and that is why there I am not playing there by 5. Therefore this one says you must 1,3 l of water. How many times per day? ----- --- {81} All learners : (realizing their mistake) : No...! Eh....! {82} Teacher : That is why the units must be in rands... ok, I am going to show you how to do 1.4 then I sit down. 1.4, 1.4 must be done first. The answer that you got in 1.3 must be converted to kilowatts. I mean sorry, kilolitres. How many litres are there in 1 kilolitre? ----- --- {85} All learners : (softly) 1000 {85b} Teacher : 1000, second step you are going to say that answer in kilolitres multiply by 3 comma 4 zero. Why are you multiplying by 3,40? {86} Learners : It's going to be rand.. {87} Teacher : Yes...(demonstrating to the learners by writing on the board) then divide everything by 1 kilolitre. It is going to be..... ----- --- {88} Learners : 1.3 {89} Teacher : Ok 1.3 you all can answer there... (pointing to the board) in 1.3. The first step in 1.4, you take the answer that is there in 1.3 convert it into kilolitres then you get there..(pointing to the step already done/written on the board)... multiply by 3,40 divide by kilolitre , the answer is there.. and for 1.4 they are saying answer rounded off into two decimal places, (talking directly to a learner) ... the question is there in a question paper is not there (point at her face/eyes). 1.4 answer rounded off to two decimal places. Why are they rounding the answer into two decimal places? Because you know that when you are dealing with money... because you know that when you are dealing with money	Demonstration is being used Teacher repeats the learners' answer Demonstrate on the board Demonstrate on the board Clarify a specific algorithm
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	you must always have two digits after a comma. So when you are rounding off to two digits, you look at the third number, if the third number is more than 5 you make it one adding to the second number after the comma, if.....”	by the use of an example to show procedural steps
Lesson 2		
	{13} Teacher : How much water is used to make tea once..? {14} Some learners : 1. 2 {15} Teacher : So listen to my example: I am paying R14 per day and I am paying that R14, 5 times a week but for a month 22 days, why are you saying 22 days, because I am coming to school 5 times a week, meaning Saturdays I am not coming to school. Therefore because... ----- ----- {61} Teacher : Go on with your work please, let’s give you 5 minutes to complete that work, then we’ll report to question 1.2. Please! Make sure that you show all the calculations! Look at this one. (pointing to the board where had written to illustrate). I am paying R14 per day 5 days per week, 20 days per month, therefore it is going to be one mark for this and one mark for that, that is why if you give the answer only you are going to get one out of two. If I were you not having a calculator, if I were you I may say, I start with making 30, I write the equation right there because I wait for the calculator go for the others, I do the same thing, I go to the next one wait for someone to borrow the calculator. I said you must have your calculator, to day is the last day. If you do not have a calculator on Monday I chase you out. You are lazy that is why you cannot do Mathematics.....Do your work, do your work. {62} Teacher : (moving from group to group, helping individual learners)	Explains with an aid of a personal contextualised example Makes an illustration

ANNEXURES

ANNEXURES

Annexure A : School 1 Classroom Observation Lesson 1 (transcript)

- {1} T : Please when you do Activity number 1 on Task number 4 make sure that you follow the steps because I am going to ask questions.
- {2} All learners : Yes.
- {3} T : ... what are you talking about, **Learners**? The 9 4's, **Learner**, I don't think you are learning on the cellphone, the 9 4's are attention.... attention
- {4} One learner : Ah Mam.
- {5} T : Attention! The class is dirty, 9 4's attention stop writing your class is dirty, you are not going to work therefore I am going to deduct 5 marks, 5 marks, and from the boys 7 girls 5 boys. Ok, for making noise is plus 2, plus 2, meaning that 7 boys 9 I am going to deduct the marks, your class is dirty I am going to deduct the marks.

{All learners pick up papers quickly all around the classroom.}

- {6} T : **Learner**, you didn't stand up, you didn't stand up (*pointing to learners who did not pick up papers*), I am going to deduct marks ... you should have cleaned the class yesterday, **Learner**,, you should have cleaned the class yesterday
- {7} Sfiso: Yesterday...?
- {8} T : Please the work must be done. You are always neat, therefore I expect neat work. **Learner**, are you working or eating? **Learner**, are you working or eating? **Learner**, ...? **Learner**, is he working or eating?
- {9} Tumelo : He was working
- {10} T : Ok. Any one who is busy coloring? Girls you are too far, you are too far and I am expecting you to complete your work today.

{Learners continued to work in groups in order to complete their work while the educator was busy monitoring them, moving from group to group. In these group discussions it was noted that some learners spoke in their vernacular languages as well.}

Group 1:

- {11} L1 : Ayi nakhu ngicedile sengiya color. Ah yini, angiyitholi
- {12} L2 : Usebenze nge pen?
- {13} L 1 : Eh?
- {14} L 2 : Did you use a pen? To highlight this?
- {15} L 1 : Oh lez' abathi ngizenze eyi uyabonake nay eng shayayo mfana.
- {16} L 2: Nawe uyi shayele
- {17} L 1: Oh, ngisebenzise ipeni kulez' abathi ngizenze?
- {18} T : 1 third is one over 3. Stop it! *{talking to another learner}* Did you get 1 over 3? *{she moves around helping other learners}*..... Stop talking and do your work *{talking to the rest of the class}*
- {19} T : How can you do to step number 6 if step number....? You must be joking. How can you go to step number 7 if you didn't not do step number 5? Is it possible? Is it possible **Learner**,? You have already done step number 7.

{she then moves around helping other learners}.....

Group 2

- {20} L 3 : Ushebe game ya Sunday, ushebe game ya Sunday , eya, ushebe game ya Sunday
- {21} L 4 : Ngicela ungiboleke I peni lapho.
- {22} T : *{addressing one learner and also referring to the entire class}* ... so that I can help you. Yes, so that I can help you. You can't just draw the line and then you call me to say to you this one is G1 this one is G7. No you must indicate them if they say draw line GF you draw it and then say GF, *{pointing, to demonstrate a line drawn with letters labeling}*, at the same time. EM, you draw the line and say EM, so that you won't be confused. You can't just draw the lines like this from day 1 to day 11. Please, if they say draw a line and maybe you draw a line name it ... don't go to the other lines...

{she then moves around helping other learners}.....

- {23} T : 90° clockwise and reflection, and reflection. *{talking to a learner}*

- Please, **Learner**, you can't go there where are the other lines?
- {24} L 5 :I have erased them.
- {25} T : Why? Because the time you erase them you must have something like this.
Where is the pen of yours? Are you doing it now, after erasing?
- {she then moves around helping other learners}.....*
- {26} T : It's going to help you
- {27} L 2 : Yes Mam.
- {28} T : What are we doing here?
- {29} L 2 : ke tlatla ke drawe fela.
- {30} T : Yes! Eh? No we are not explaining, ok that one you do just
like this one use this method.
- {she then moves around helping other learners}.....*
- {31} T : What process is taking place there? Please you are not explaining, that needs
no explanation.
- {32} L 2: Yes Mam.

Another Group 3

- {33} L 6: tswantse e shebe kwa
- {34} L 7: Akere it must be like that.
- {35} L 6 : E yalo a kere
- {36} All the others in the group agree: E e yalo
- {37} L 6 : E yalo, so ... e ke e *{pointing at the sketch of lines}*
- {38} L 7 : Then e ke e, *{also pointing at the sketch of lines drawn}*
- {39} L 8 : Le a bona, itswanetsi inne so *{showing them the SA flag from a Constitution booklet}*
- {40} L 6 : engwe inne fa inne wide..

{41} L 8 : bona gore flag e yang?

{42} T : { *commenting on the discussion*} Ok you can use this one, but before you erase everything I want to see all the letters in this thing, I want to see it. {Putting the Constitution booklet aside from the group} Follow the instructions, there in the book.

{she then moves around helping other learners}.....

{43} T :Chris I think it's somewhere there in step number 7 they said use, step number 7, use a pen to highlight the following line. Where is your line C1?

{she then moves around helping other learners}.....

{44} L 9 : {*asked a question which was not clearly captured*}

{45} T : Ok, read the question.

{46} L 9 : {*reads a question to the teacher – not clearly capture*}

{47} T : Transformation, listen, its either reduction of enlargement, so which one was that

{48} L 9 : Reduction

{49} T: {*referring to a certain learner but speaking to the entire class*} Le se ke la fojara, e tswane fela like this, ga u yi kryer ibe u e kryer go na yana. Please you must follow the steps, if you don't follow the steps your flag will never be correct.

{she then moves around helping other learners}.....

{50} T : Please! No mistakes!

{51} L 10 : ... enyane....?

{52} T : That small mistake that one.....!

{she then moves around helping other learners}.....

Back to group 3

{53} L 7 : e ko dimo....

{54} L 6 : e e (no) eko dimo ga, ga e....

{55} L 8 : Eya....

{56} T : Attention again. *{addressing the whole class}* Attention! Please make sure that you can't draw and color at the same time.

{57} Learners: Yes

{58} T : Make sure that you draw everything, you highlight the lines that needs to be highlighted, you erase those that need to be erased then you start coloring, please you cannot draw and color at the same time. **Learner**, you are going to make a big mistake. You have a pencil on ones side then on the other side you have a coloring pen.

{59} L 11: { **Learner**, *denying* } ... no...

{60} T: There it is, I am talking about this.

{61} L11 : E, a ke se drawe

{62} T : That is why I am saying, please make sure that you draw everything, after drawing you can start coloring.

{63} T : *{Referring to other learners who were seemingly cheating the activity}* Lona la fojar a la epsa ntho tse.. so... lafojara.

{she 4hen moves around helping other learners}.....

{64} T : *{Talking to a learner }* Highlight it, this one, is there any instruction that sa9s erase it?

{65} T : *{Talking to the whole class}* Please you cannot erase all the lines, in the step 7 is n/t highlighted, the line number 7 must be highlighted first from there you erase. Please if your flag is deurmekaar I am going to mark you wrong and you lo3e 8 -arks.

{66} L 02 : 8 marks..?

{67} T : Yes!

{she the. moves around helping other learners}.....

{68} T : Please pack your things it's Technology period

{49} H 9 : am please come here quickly for 5 minutes

{70} T : Please pack your things it's Technology now

{she then moves to the learner summoning for assistance at the end of the period}

Annexure B : School 1 classroom Observation Lesson 3 (transcript)

- {1} Teacher : (*Hands out learners workbooks, calling each learner by name to come and collect from the front. One learner decides to take for others sitting at the back, add the teacher spoke in Tswana trying to stop her and she responded in Tswana that she did this for those sitting at the far back of the class*) “ ... **ke tla ditlisa ko morago....**”
- {2} Teacher: (*reprimanding a learner in the front group in Tswana, speaking in a low voice*) “ **Bona...**”
- {1} Teacher : Please underline the work, write today’s date, underline the work, because we will be 2.5. Please underline. Please leave 2.4 know that it’s your own baby, it’s not line. OK, write today’s `at% Task number 3 activity number one. Today’s date, task number one. (*Moving around from table to table and group To group*). It is the 8th activity number one task number 3. Today’s da4e. Three seconds for you to go through the activity on page 12. don’t know whether yours also says page 12. Yes! Page 12. read the information that is there, but I am going to give you an example to do. (*The teacher taps the table as if making some drum beats.*)
- {4} Learner 1: Time’s up....
- {5} Teacher : What is the meaning of this song, because there is a saying that says: “ action speaks louder than words,” can any one read the first question for us?
- {6} Learner 2: (*begins to read*)
- {7} Teacher: Listen, listen, listen, listen..... Yes **Learner**, ...
- {8} Learner 2 : (*continues to read*) ... if one week refers to seven day, and { one.....
- {9} Teacher : seven days
- {10} Learner 2 (**Learner**) : and one month refers to 30 days, determine the estimated monthly water consumption for.....
- {11} Teacher : What is the question please.....? 1.1.1
- {12} Learner (**Learner**) : Making tea...
- {13} Teacher : How much water is used to make tea once..?
- {14} Some learners : 1. 2

- {15} Teacher : So listen to my example: I am paying R14 per day and I am paying that R14, 5 times a week but for a month 22 days, why are you saying 22 days, because I am coming to school 5 times a week, meaning Saturdays I am not coming to school. Therefore because... (*interrupted by a learner who entered the class to talk to the teacher*) ... listen a month is having 30 days. How many times do you come to school in this 30 days? It's going to be 5... how many days are there in a week (*should be how many weeks are there in a month*)
- {16} All learners : 7/4
- {17} Teacher : Therefore how many days do you come to school? (*she writes the responses on the board*) : $5 \times 4 = 20$.
- {18} All learners : 20 days!
- {19} Teacher : Is it 20?
- {20} All learners : Yes!
- {21} Teacher : It's 20. Therefore if you want to know how much are you going to be paying per month, you are going to say: you know that I am paying R 14 per day. What about per week? How many weeks?
- {22} All learners : 4
- {23} Teacher : I am paying R14 per day. How many days am I coming to work per month?
- {24} All learners : 5 days
- {25} Teacher : Per month
- {26} All learners : 20
- {27} Teacher : It's 20. Therefore, which means how much am I going to pay? This amount....(*pointing to the answer of: $14 \times 5 \times 20 = \underline{\hspace{2cm}}$ O*). This one is the one that I'm paying per day. (*pointing 4owards the answer*). How many days per week?
- {28} All learners 8 5
- {29} Teacher : How many weeks per month?
- {30y} All learners : 20

- y31} Teacher: Therefore how much am I going to pay?
- {32} One learner : (*gives an incorrect response*) One thousand two hundred
- {33} Teacher: One thousand...?
- {34} One learner :two hundred
- {35} Teacher : I 'm not think its 1200 it's even less than R500.
- {36} All learners : R288,
- {37} Teacher: R288. (*learners talk in Setswana, mocking the one who gave the wrong answer*) Therefore the first question is saying you are using 1, 2 kilos of water how many times a day?
- {38} One learner : 3 times
- {19} Teacher : 3 times a day. How -any times per month?
- z40} Another learner : 3 times
- {41} Teacher: We are using it everyday. The question says f one week refers to 7 days, but week because I am coming tm school it's Mon.....Fr. It's 5 days. Therefore it means that going do be 5, and that is why there I 'm not playing there by 5. Therefore this one says you must 1,3 l of water. How many times per day?
- {42} All learners : 3 times
- {43} Teacher : How many times per month?
- {44} All learners : (*murmuring*)
- {45} Teacher : How many times per month?
- {46} All learners : 30 times
- {47} Teacher : 30 times, that's what you will calculate the amount of water that you are going to use tea it is going to be 1, 2 times...?
- {48} Steven: times seven *letters an incorrect answer*)
- {49}Teacher : it's sleepy, (*speaking in another language: " nna ke go bulelets.."*) I3 it times 7? ... cause you are using it three times a day!

{50} Steven: Oh !

{51} Teacher : 9 times thirty. This is how you are going to answer all the questions that are there. Make sure that you use all the information that is there on Page 10. The questions are there on page 11. Firstly the total water that you are going to use for making tea. Don't forget that you are using 1,3 l of water 3 times a day, 30 times per month. Washing water, how many times? 20 litres 3 times a day times 30. Flushing the toilet, 10 litres, how many times a day?

{52} All learners : Eleven times

{53} Teacher : per month?

{54} All learners : 30

{55} Teacher : washing clothes?

{56} All learners : twice per week

{57} Teacher : Twice per week **a kere**? Therefore it's going to be 50 times...

{58} All learners : 2

{59} Teacher : Is it times two? How many weeks are there in a month, are they two?

{60} All learners : Oh 4

{61} Teacher : Go on with your work please, let's give you 5 minutes to complete that work, then we'll report to question 1.2. Please! Make sure that you show all the calculations! Look at this one. (*pointing to the board where had written to illustrate*). I am paying R14 per day 5 days per week, 20 days per month, therefore it is going to be one mark for this and one mark for that, that is why if you give the answer only you are going to get one out of two. If I were you not having a calculator, if I were you I may say, I start with making 30, I write the equation right there because I wait for the calculator go for the others, I do the same thing, I go to the next one wait for someone to borrow the calculator. I said you must have your calculator, to day is the last day. If you do not have a calculator on Monday I chase you out. You are lazy that is why you cannot do Mathematics.....Do your work, do your work.

{62} Teacher : (*moving from group to group, helping individual learners*)

{63} Teacher : Ok! Attention, attention... let me get the question in 1.1 Activity one. (she reads the question) “ If one week refers to 7 days.....” What will be the units for the answers that you are going to get? From 1.1.1 up to 1.1.5? What will be the units? **Learner**?

{64} **Learner** : litres

{65} Teacher : Why, because they are saying how much water. Please you cannot measure water in rands or cents. You measure water in litres. That's why she is saying the units must be litres. Please! You cannot measure water in weeks, but you can calculate how much water you can use weekly, but the units must be litres because you are looking for the amount of water not the amount of weeks.

(helping individual learners in groups moving from one learner to the next) "...open your book so that I can help you...1.5 let me have a look at the question..."

{66} Teacher: Attention, please for the clothes, do not forget that we are not washing everyday we are washing twice a month, therefore how, I mean two times a week, therefore it means those thirty days must be converted into weeks, which is how many weeks are there in a month.

{67} All learners : 4

{68} Teacher : Therefore it means you are not going to say 30 days is going to be 4 weeks, because you Are washing per week in a month, please, sharp-sharp, sharp-sharp ...then say thank you to me, say thank you... can we move on to 2.2.

..... you are wasting time,.... Sorry...you are wasting time,....please you can't waste time

{69} Teacher: Attention, we need to get the information so that we cannot stop writing. At4ention, 2.2 let us read the question and then we go back to 2.1, let's road the question in 2.2, anyone who can read the question for us? **Learner**, can you please read the question for us?

{70} **Learner** : *Efing?*

{71} Teacher : Show by calculation that Mr Molaka's family will be using more water than free 600 l of water given per one, to the basic needs.....listen care fully....., ok for 1.2 you are going to add all the litres of water that you have bee calculating so that you can get the amount of water that has been used per month. For 1.2, in 1.1 you have been calculating how many litres must you use for making the tea, how many litres you have been using for washing, how many litreswhat else, for cooking, for bathing, for flashing. Therefore 1.2 says, show by calculating how much water is he going to use. How are you going to answer that question? By adding all the total of waters that are there. Add everything that is there. So that you can get the answer for 1.2.

{72} Learner 1 : Mam...! Mam...!

{73} Teacher : 1.3, please 1.2 do not forget that in 1.2, it's the sum of all the litres that you have been calculating in 1.1, 1.3 "How much excess water was consumed?" You are going to say the answer that you got in 1.3. Ok I am not going to say it like that. I must think. I can't just say it like that, 1.3 the answer that is going to be there is the difference between the answer that you get in 2.2 and 6000. E.g. should I give you the e.g.?

{74} All learners : Yes!

{75} Teacher : If you don't know what the difference is please there are no keys there it's open, the toilets.... 1.3 will the difference between 6000 and the answer that you got in 1.2. 1.2 sum of all the answers that you got in 1.1.

....helping individual learners from group to group.. learner to learner....

....some learners in a group observed discussing in English....

...the teacher moves from table to table in groups monitoring and give

{76} Teacher : **Tom1** where are you going? (talking to another learner this time) Have you done 1.3? Steven have you done 1.3.

{77} Steven : Yes!

{78} Teacher : Ok in 1.4, the answer that you got in 1.3 must be converted to kilolitres. I am talking about.... **Tom2, ke mang**...? I 'm talking about 1.4 not 1.3, please. Ok, attention 1.4 what does the question say? Please don't just go straight to the answers make sure that you read the questions before you start answering. 1.4 how much Mr, Mrs Moabelo's family pay for the excess water consumed in that month in 1 kilolitre cost if one kilolitre cost R3,40c. What will be the unit for 1.4? Stop writing. What will be the unit for 1.3, I mean 1.4? If you think you know the answer or if you want to try, just raise up your hand! Read question 1.4. Read question 1.4! What will be the unit for 1.4? We are going to hear **Tom3**.....

{79} **Tom3** : It's going to be in rands.

{80} Teacher : It's going to be rands because they are saying, how much will you pay, are you going to pay in metres?

{81} All learners : (realizing their mistake) : No...! Eh....!

{82} Teacher : That is why the units must be in rands... ok, I am going to show you how to do 1.4 then I sit down. 1.4, 1.4 must be done first. The answer that you got

in 1.3 must be converted to kilowatts. I mean sorry, kilolitres. How many litres are there in 1 kilolitre?

{83} All learners : 1000

{84} Teacher : Therefore firstly convert them, the answer that you got in 1.3, into kilolitres, one mark for that. Second mark, take that kilolitre, multiply it by R3, 40c, then divide by 1 kilolitre. Firstly where will y/u get the first mark? converting the answer that you got in 1.3 in to kilolitres. How many kilolitres.....How many litres are there in one kilolitre?

{85} All learners : (Softly) 1000

Teacher : 100 , second step y/u are going to say that answer in kilolitres multiply by 3 comma 4 zero. Why are you multiplying by 3,40.

{86} Learners : It's going to be rand..

{87} Teacher : Yes...(demonstrating to the learners by writing on the board) then divide everything by 1 kilolitre. It is going to be like this. This is the answer that you got in 3.2 in kilolitres, then multiply by R3, 40c, divide by 1 kilolitre, therefore kilolitre is going to do....., kilolitre therefore the is going to be in rands then find the answer. Firstly, 3. eh... is it 1.3.3.1?

{88} Learners : 1.3

{89} Teacher : Ok 1.3 you all can answer there... (pointing to the board) in 1.3. The first step in 1.4, you take the answer that is there in 1.3 convert it into kilolitres then you get there..(pointing to the step already done written on the board)... multiply by 3,40 divide by kilolitre , the answer is there.. and for 1.4 they are saying answer rounded off into two decimal places, (talking directly to a learner) ... the question is there)n a question paper there (point at her face/eyes). 1.4 answer rounded off to two decimal places. Why are they rounding the answer into two decimal places? Because you know that when you are dealing with money... because you know that when you are dealing with money you must always have two digits after a comma. So when you are rounding off to two digits, you look at the third number, if the third number is more than 5 you make it one adding to the second number after the comma, if the third number is lesser than 5 you make it zero add it to the second number after the comma, sharp.. sharp, then you can go on with your work. (putting the workbook on the table)

{...The teacher moves from table to table monitoring learners' work and giving directions/correction where necessary...}

{90} Learner(Steven) : Mam I am finished...

{91} Teacher : No you have to go to the next activity.. please how do you get the answer for 1.3? 1.3 is the difference between the answer that you got in 1.2 and 6000. To get the answer for 1.3 you must find the difference between the answer that you got in 1.2 and 6000. 1.4 is the first step, convert the answer that you got in 1.3 in to kilolitres and don't forget that there are thousand litres in one kilolitre. Second step in 1.4, multiply that kilolitres by 3, 40 then divide by one kilolitre. All the calculations must be shown so that you can get total marks.

{92} Steven : Ok Mam is this the first question....

{93} Teacher : Yes

{94} Steven : So I must just...underline...

{95} Teacher: ... underline it.... 1.3 must be the sum of the answer that you got in 1.2 and 6000..... the difference is not the sum. 1.4 the first step, the answer that you got in 1.3 convert it into kilolires, and don't forget that one kilolitre is equal to a thousand litres, not grams, litres, after converting it, make sure that, take that number in kilolitres multiply by 3,40 then divide by one kilolitre then you get the answer.

{96} Teacher : Steven, I don't think there is another way of explaining activity 2, 2.1

{97} Steven : Yes Ma'm yes...

{...The teacher moves from table to table monitoring learners' work and giving directions/correction where necessary...}

{... in another group, the learners are observed talking in their vernacular and discussing the work as they complete the problems.....}

{... the bell rings..... signaling the end of the period}

{98} Teacher : Please your work must be up to 1.4 you underline everything the period is over and I have to go Ok how do you get the answer for 1.2?

{....learners are busy ensuring that their work is completed....}

{...the teacher continues to assist learners as they make final steps to their work...}

{99} Teacher : Please all questions must be up to 1.4! Yes... underline if your work is up to 1.4. Please don't forget that for 1.4 the answer...Jacob! (talking to another learner, named Jacob.).... Shut up just for a minute. 1.4 says the answer must be to two decimals.

{ ...Once again learners in their groups continue to discuss their work in their vernacular languages...}

{100} Teacher : {...pointing to the board towards R 79, 937...} So if the answer is like this, its says two digits after the comma, what will be the answer to this one? Two digits after the comma, (pointing to the number R79, 937). What will be the answer to this one ... **Tom4**? What will be the answer? It says two digits after the comma! Listen..... I said you look at the third number, the third number is more than 5 Please leave if your work is up to 1.4 underline. Please your work must be up to 1.4, underline and we will continue tomorrow. Please bring your work everybody.....

Annexure C : School 1

Learners' (3) Interviews (transcript)

Learner 1

- a) Do you think all the languages enjoy equal status in your classroom? Why?

1. Yah I think so. It's the same because in any language is gonna do with this they still going to understand this ..e.. they 're still going to get the point of the thing that the teacher is trying to explain. They gonna do like (you think all languages are equal?) Yah.

- b) Are you able to freely express yourself in your vernacular during you2

Mathematics lessons? Explain.

2. Definitely no! I can't. (explain). Because of the..., they way....like the numbers, like, ungwe, pedi, tharu, I wouldn't, I don't know, I wouldn't go up to ten. That is to say I wouldn't go up to twenty seven, twenty eight,... I wouldn't be able to do that in my language.

- c) 1. When do you use your mother tongue in your Mathematics class?

C1. If I can,...If I am helping another person If I can see that they do not know or they do not understand properly in English, then I 'll try and explain in another language.

2. Are you aware that the South African constitutions allows for the equal practices of all languages?

No I wasn't aware of it.

- d) 1. Would you say that the parents are happy with English as the language of learning and teaching?

D1. No. I wouldn't say so. Because they say that we're getting too much into English and we're leaving our own, our mother tongue behind.

2. Is this stipulated in the language policy of the school? Have you been made aware by the SGB?

D2. No.

- e) Would you be comfortable if in your class your Mathematics teacher explains the Mathematics problem in English and in your vernacular as well as well?

Yah. I will be comfortable. Sometimes there're some things that in English you won't get as much as in your vernacular language, so, I would rather sometimes have them to ... the numbers I would like them in English but the explanation in the mother language.

Learner 2

a) Do you think all the languages enjoy equal status in your classroom? Why?

1. Yes sir I think so. (why) Sir sometimes according to the class I do not understand where the teacher explains in English so he or she will ask a friend to at least explain in some other language for him or to understand better.

b) Are you able to freely express yourself in your vernacular during your Mathematics lessons? Explain.

No, sir. For me it's hard, cause I never spoke vernacular so when it comes to say...like, I cannot say in a different way. It's not what I, it's not my own doing that.

c) 1. When do you use your mother tongue in your Mathematics class?

C1. I use it when, maybe a lot of times I use it when I speak to someone who doesn't understand English. But other than that we love talking in English.

2. Are you aware that the South African constitutions allows for the equal practices of all languages?

C2. I wasn't aware. I thought that maybe all children understand English...so...so what.. I thought that. To me it seems like English fob a lot of chiLd2en outside There if you call him or her and you talk to him or her in English he or she will understand.

d) 1. Would you say that the parents are happy with English as the language of 194 learning and teaching?

Yes they are very happy. (laughing). Yes they are, very happy, (why) cause I have a younger sister coming, so she wants to hear from me cause I'm the older one so whatever I do she also wants to do so for me to teach her she has to see good things from me in order to do.

194 2. Is this stipulated in the language policy of the school? Have you been made aware by the SGB?

D2 No. Wow! (very much surprised) I never, I never checked something like this.

- e) Would you be comfortable if in your class your Mathematics teacher explains the Mathematics problem in English and in your vernacular as well as well?

No. no. (why, explain) Sir if a teacher explains in Maths. I would like her, him or her to explain in a particular way in English, but in others, cause sometimes, when somebody starts, especially when the teachers speak vernacular, some other children are going to take as if, ok now, she is saying this and then we can all say it. And then it's gonna be a ...trouble.

Learner 3

- a) Do you think all the languages enjoy equal status in your classroom? Why?

1. OK what I've noticed is that although it's an Afrikaans school, and we are supposed to speak English in our classes, most of the kids speak in like African Languages nobody care about them that much.

- b) Are you able to freely express yourself in your vernacular during your Mathematics lessons? Explain.

Yah I do, our teacher is OK with it. There is no problem with it.

- c) 1. When do you use your mother tongue in your Mathematics class?

C1. Uhm. Ok I use it when I am tired of speaking English. cause sometimes I do get tired when everybody is speaking Tswana, and I am like it's OK now I am going to speak Tswana.

2. Are you aware that the South African constitution allows for the equal practices of all languages?

C2. Oh, I honestly didn't know that. I didn't know. I just think we are supposed to speak English because it's an English school.

- d) 1. Would you say that the parents are happy with English as the language of learning and teaching?

D1. Yah I do, I think they will appreciate English. Put for. I speak to her in English.

2. Is this stipulated in the language policy of the school? Have you been made aware by the SGB?

D2. Uhm I 'd say no. Because it's an Afrikaans and English school. Not really. But I think that it's something that we all know.

- e) Would you be comfortable if in your class your Mathematics teacher explains the Mathematics problem in English and in your vernacular as well as well?

No. I prefer the teacher does it in English because it's going to confuse us if she is switching languages all the time. Because it's only easier when you speak one language. Then you could get more, that is what I think.

Annexure D : School 1Teacher's interview (transcript)

a) What is main your main language?

1.a. I don't. understand when you say main language. My mother tongue is Setswana. But where I am working the medium of instruction is English and Afrikaans,..... I am doing all my classes in English.

b) Which language do you use as your medium of instruction?

b. It's English

c) If you had a choice which language would you prefer for teaching?

English

d) Do all the languages enjoy equal status in your classroom? Why?

d. I think they do all enjoy, more especially when using English. Because I think English is the simplest language whereby all learners understand. It's the only easiest language. (Are you saying that because the learners can also say in their own languages?) They can talk in their own language but it's difficult, I'm a Setswana speaking person, but it will be very difficult to teach Maths in my own language because even to myself it is very tough. Because even if you go to the schools whereby they are using Setswana or Xhosa or whatever, as a medium of instruction, but when it comes to Maths they always use English.

e) Do you use your mother tongue for teaching? If so, when?

e. No. But sometimes if they ask questions, but they may ask a question in Setswana or sometimes they may say Mam can you please explain to us in Setswana, but I know that it is difficult, so each an every time they may say Mam we don't understand can you please say this thing to, in Setswana. Sometimes I say to them I know that you want me to explain everything in Setswana so that you can understand but I know that it's going to be tough I always ask them the question and I say to them what do you call five in Setswana? They do not know. What do you call eight in Setswana? They do not know. So I figured its going to be difficult for them. That's why I considered it's difficult.

f) 1. What is the language policy of the school?

f.1. It is English. But it is English and Afrikaans. Not English alone.

2. In your opinion is this policy in line with the language-in-school policy? Please elaborate

f.2. I think... yes it is. Because most of the, we are not speaking the same language here, there are the Xhosas, the Zulus and whatever. And the only language that I understand up to this point is Afrikaans, English and Setswana. Because I am using English, which is the medium of instruction that is why even the Xhosas, the Zulus, and what ever, those doesn't know Setswana can understand.

- g) Would you say that the parents are happy with this language as the language of learning and teaching?

g. I think they're happy. I think they are happy. Because they.... according to my own opinion I am a parent too, because I understand English, I work with the kids from different languages but only to find that I have seen that even though the are using different mother tongues but when it comes to English they always, they all understand. That is why I am saying maybe even the parents are happy because I didn't have a problem whereby we are having a problems whereby the (teachers) parents were saying please this kid of mine is not using English at home why are you preferring to teach her in English, why can't you teach her in a mother tongue. Yes they are happy.

- h) Have you been made aware by the School Governing Board (SGB)?

h. Yes.

- e) Would you be comfortable in your class to explain the Mathematics concepts or problems in English and in the majority language (African) spoken by your class? Why, or why not?

g. I won't be comfortable. Because I may start with my mother language, its Setswana, it's tough, is very tough. Even myself won't be able to express everything in Setswana because some of the words we are having the Tswana name for them but we just call them in English, more especially when it comes to the numbers. When, OK let me count for you from number one up to number five, in English it's one, two three, four, five. Even if you can go to the young lady, the baby who is five years old will count to you, she will say one, two, three, four, five, but when it comes to the mother tongue, Setswana, it's ungwe, pedi, tharu, nne, tlhanu. Even when I am at home, I am speaking Tswana at home, but if I want somebody to go to the shop to buy the oranges I need five of them I'll never say to him go and buy dinaume dilithlanu I always say tsamaya u reke dinamune dili five.

**Annexure E : School 1, 2 and 3 learners and parents
questionnaire open section analysis**

**LEARNER QUESTIONNAIRE
SCHOOL 1**

Open-ended questions

1. Lists the languages that you can understand and speak.
English (27), Afrikaans (9), Sotho(6), Venda(1) and Tsonga(1), Tswana(27), Sepedi(3) Xhosa(8) Swati(1), Zulu (13), Ndebele(1)
2. Do all the languages enjoy equal status in your classroom? Why?
“Yes” 14 = they all speak their languages and they all understand English (8) “No” 10 = will not understand (2) 199 it is an English/Afrikaans school (5)
3. Which language is most spoken in your classroom?
English (23), Setswana (13), Zulu (1)
4. Which language would you prefer to learn with at school? Why?
English (32) = easy to understand (9) it's universal and better understood by tourists(3) Has been used for a long time.(1) It's an English first school (5) Tshivenda (1) = mother tongue
5. Which language would you prefer when solving Mathematics questions in a test?
English (33) Setswana = 2
6. When do you use your mother tongue in your Mathematics class?
When talking to friends(12) when English is a problem and when more understanding is Required (7)
7. Are you able to freely express yourself in your vernacular during your Maths lessons, especially when you do not understand? Explain.
Yes (15) = in cases where they cannot express themselves in English (7) Talking to the educator (4) No (7) = English is easy (5)

8. A friend of yours struggles to understand the English language in a Mathematics problem. Explain what you could do to assist?
Explain in her language (26). 26/33 {language as a barrier to solving mathematics problems }
9. Would you be comfortable if in your class your Mathematics teacher explains the Mathematics problem in English and in your vernacular as well as well?
“Yes” 15 = comfortable, in order to assist the understanding of Mathematics((6). No supporting reason (8) “Jo” (5) = might not help, but only confuse (3)
10. Will you Consider learning Mathematics if your mother tongue besides English if given a chance? Why?
“No”(22) = because normally mathematics is easier in English, else they might not understand (18) teachers cannot teach in all vernaculars, (1) it might take a longer time to explain, etc (1) “Yes” (6) = thy would understand (2)

SCHOOL 1

PARENT QUESTIONNAIRE

Open-ended questions

1. Lists the languages that you can understand and speak.
English(29) Afrikaans (13) Sotho (5) Tswana (19) Xhosa (5) Sepedi (2) Venda(2), Ndebele(2) Zulu (6)
2. In your knowledge which language is mostly spoken in your child's classroom?
English (27) Setswana(6)
3. Do all the languages enjoy equal status in your child's class? Why?
'No' (15) = because the language of teaching and learning is English alone, and to accommodate others only English is used. (7) = no reason (7) "yes" (9) = communicate with each other(4) there are different languages (2)
4. Which language would you prefer your child to learn Mathematics with at school?
English (32) Tshivenda (1)
5. In which language would you prefer questions when answering Mathematics questions in a test?
English (31), Tshivenda (1)
6. Should your child be allowed to freely speak in any language including mother tongue in class? Explain when.
"yes" (16) = (10) for occasions where learners cannot express themselves in English. "no" (16) = (8) subjects are in English and not in other languages, the teacher might not understand.
7. Would you allow your child to learn Mathematics in his/her mother tongue if given an opportunity to do so? Why?
"No" (22) = It is an English school (1) English is better, easier, because other children might not understand (8) the mathematics better in English, challenges for future, tertiary education (3) "Yes" (7) = (3) no reason they will understand better (2) All languages are equal (1)

9. Your child claims that she/he cannot understand the English language in his/her Mathematics homework? How could you assist?
Solve the language problem, whether by teaching more English vocabulary or using/translate into another African language(18)
10. Would you be comfortable if in your child's Mathematics classroom the teacher explains the Mathematics problem in English and in your child's mother tongue as well? Why?
"Yes" (16) = due to the lack of English, it will assist with understanding. "No" (6) = teachers might need more time(1), she might not even know other languages(1) prefers English only (2)

SCHOOL 2 LEARNERS

Open-ended questions

1. Lists the languages that you can understand and speak			
Enflish = 11	Afrikaans = 8	Setswana = 6	IsiZulu = %
Xhosa = 2	Setsonga 1	Swati = 1	Portuguse = 1
2. Do all the languages enjoy equal status in your classroom? Why?			
No (6) = others do not know all other languages only English(6)			
Yes (4) = kids come from different homes (1)			
They can all understand each other (3)			
3. Which language is most spoken in your classroom?			
English = 9			
Afrikaans = 2			
4. Which language would you prefer to learn with at school? Why?			
English (11) =it's mostly used in work places (1)			
= all learners know it, it's easier and understand it(7)			
= different races (1)			
= open doors for future (1)			
= no reason (1)			
5. Which language should you prefer when solving Mathematics questions in a test?			
English(11)			
6. When do you use your mother tongue in your Mathematics class?			
when talking and discussing with friends (6)			
when English is a problem (2)			
when they have completed their work = (2)			
Never(!)			
7. Are you able to freely express yourself in your vernacular during your Maths lessons, especially when you do not understand? Explain.			
Yes (5) = in cases where they cannot express themselves in English(1)			
In cases where they dot understand Afrikaans(1)			
Extra classes with mother tongue (1)			
When there are words they cannot understand (2)			
No (3) = time taken to communicate with everyone's language(1)			
Communicates in English(1)			

Most learners do not understand Afrikaans(1)
8. A friend of yours struggles to understand the English language in a Mathematics problem. Explain what you could do to assist?
I could help by explaining to him in her/his language (10)
9. Would you be comfortable if in your class your Mathematics teacher explains the Mathematics problem in English and in your vernacular as well as well?
“Yes”(7) = in order to assist understanding (3) no reason (4) “No” (3) = no reason(1) might not understand(1) would be fun but unfair (1)
10. Will you consider learning Mathematics in your mother tongue besides English if given a chance? Why?
“No” (8) = because normally mathematics is easier in English (2) grew up talking English (1) never got a chance to use it when they were young(1) Portuguese is hard to understand (1) Other kids cannot understand it (2) “Yes”(3) = all mothers would like to know their it, and they know their it (3)

SCHOOL 2

PARENT QUESTIONNAIRE

Open-ended questions

1. Lists the languages that you can understand and speak.
English (13) Afrikaans (8) Sotho (3) Setswana (7) Zulu (6) Portuguese(2) Xhosa (2) Swati (1)
2. In your knowledge which language is mostly spoken in your child's classroom?
English (11) Afrikaans (4)
3. Do all the languages enjoy equal status in your child's class? Why?
"Yes" (5) = because all learners can talk their languages (5) "No" (4) = different backgrounds (1) others do not understand other languages(3)
4. Which language would you prefer your child to learn Mathematics with at school?
English (all) < 12
5. In which language would you prefer questions when answering Mathematics questions in a test?
English (all) = 12
6. Should your child be allowed to freely speak in any language including mother tongue in class? Explain when.
"Yes" (8) = to communicate with other learners(6) South African has many languages (1) They will understand it more (1) "No" (4) = at school they must learn English, this will not improve their English (2) 205 come from different races, and can't understand other languages (2)
7. Would you allow your child to learn Mathematics in his/her mother tongue if given an opportunity to do so? Why?
"No"(8) = because other children might not understand as Maths is easy in English (6) might need more time to teach the mother tongue (1), the mathematics better in English challenges for tertiary education (1) "Yes" (4) = can dg better in mo4her tongue, and it is important (3) take her to school where all languages are spoken (1) no (not understand) 6/12___ %
9. Your child claims that she/he cannot understand the English language in his/her Mathematics homework? How could you assist?

Help him learn in the language he/she understands(5! Use study guides(1) Assist to206learn English more (2) Get someone to help the child, even with homework (2) Take he2 to another where she could understand (1)	5/12
10. Would you be comfortable if in your child's Mathematics classroom the teacher explains the Mathematics problem in English and in your child's mother tongue as well? Why?	
"Yes"(11) = due to the lack of English, it will assist with understanding (11) "No" (2) = hard for the child to understand (1) a lot of work for the teacher (1)	

LEARNER QUESTIONNAIRE SCHOOL 3

Open-ended questionc

1. Lists the languages that you can understand and speak.
English(29), Afrikaans (4), Sotho (9) Venda (2) Zulu (15) Setswana(25) Sepedi (4), Xhosa (3)
2. Do all the languages enjoy equal status in your classroom? Why?
No (14) = not all the learners can speak all the different languages(4) they are taught in English all the time (5) different mother tongue and some words they cannot understand (3) others can't understand Maths in other languages, eg. Zulu, etc(2)
Yes (10) = all talk their own but different languages (6) Because they all understand the language used in class for Maths (4)
3. Which language is most spoken in your classroom?
English (19) Setswana (14) Afrikaans (1)
4. Which language would you prefer to learn with at school? Why?
English (27) = it's international (7), everyone knows and understand it (16) the first language of the school Afrikaans (2) = because I understand better (1) To improve the language(1)
5. Which language would you prefer when solving Mathematics questions in a test?
English (28) Setswana (2) Afrikaans (1)
6. When do you use your mother tongue in your Mathematics class?
when talking to friends (7) when English is a problem, and when more understanding is required(10) when the teacher is explaining (5) Never(3) Sometimes when necessary(2) Whenever (2)
7. Are you able to freely express yourself in your vernacular during your Maths lessons, especially when you do not understand? Explain.
Yes (19) in cases where they cannot express themselves in English and need help in a mother tongue (12)

Sometimes the teacher talks in Setswana(5) When explaining (2) No (5) = not many people understand (2) Always talks and are used to English (3)
8. A friend of yours struggles to understand the English language in a Mathematics problem. Explain what you could do to assist?
They would solve the language problem (23), or using/translate into another African language. They would explain (3)
9. Would you be comfortable if in your class your Mathematics teacher explains the Mathematics problem in English and in your vernacular as well as well?
“Yes” (24) = in order to assist understanding (3) no reason(19) would be comfortable(2) “No” (3) = no reason
10. Will you consider learning Mathematics in your mother tongue besides English if given a chance? Why?
“No” (22) = because normally mathematics is easier in English else it will be difficult (15) too many vernaculars and they don’t have Maths words to use in Maths (3) no reason (4) “yes” (7) = to understand better (6) = do not mind (1)

SCHOOL 3

PARENT QUESTIONNAIRE

Open-ended questions

1. Lists the languages that you can understand and speak.
English (25), Afrikaans(5), Sotho(8), Xhosa(3), Tsonga (3), Zulu(15), Tswana (18), Sepedi(1), Venda(1)
2. In your knowledge which language is mostly spoken in your child's classroom?
English(25) and Setswana (8) Zulu(1).
3. Do all the languages enjoy equal status in your child's class? Why?
"Yes" (16) = because they are all free to speak their own vernacular languages which they understand (14). 209 No reason(1) "No" (9) = they don't because it should be English () have an Afrikaans problem (2) no clear reason(1)
4. Which language would you prefer your child to learn Mathematics with at school?
English (31) 209 Setswana (3) 209 Zulu(1)
5. In which language would you prefer questions when answering Mathematics questions in a test?
English (31) Setswana (2)
6. Should your child be allowed to freely speak in any language including mother tongue in class? Explain when.
"Yes" (20) = to assist learners if they do not understand as it is easy (10) To talk to friends (1) To know other languages, be multilingual (2) "No" (7) = they are supposed to speak and practice in English because it's an English school (3) = might not understand (2)
7. Would you allow your child to learn Mathematics in his/her mother tongue if given an opportunity to do so? Why?
"Yes" (14) = in order to learn and understand mathematics better(14) "No" (14) = about the workplaces and lack of textbooks (3) they would not understand(3) must learn in English as she chose it (4)

9. Your child claims that she/he cannot understand the English language in his/her Mathematics homework? How could you assist?
To solve the language problem, whether by teaching more English vocabulary or using/translate into another African language(25). 25/31
10. Would you be comfortable if in your child's Mathematics classroom the teacher explains the Mathematics problem in English and in your child's mother tongue as well? Why?
"Yes" = 20 , due to the challenges to understand in English, it will assist with understanding(19) "No" = 4 = prefers only English for their children (2)

Annexure F : Ethics Clearance letter

Annexure F : Consent letters

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