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DISCOURSE PRACTICES OF MATHEMATICS TEACHER EDUCATORS IN INITIAL TEACHER TRAINING COLLEGES IN MALAWI

by

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A thesis submitted in fulfillment of the requirements for the degree of

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DECLARATION

I declare that this research report is my own work, except as indicated in the acknowledgements, the text and the references. It is being submitted in fulfilment of the requirements for the degree of Doctor of Philosophy at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other institution.

_____ _____

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ABSTRACT

This is a qualitative research that draws on Fairclough's Critical Discourse Analysis methodology to analyze the discourse practices of the mathematics teacher educators in initial teacher training colleges in Malawi. The study involved four mathematics teacher educators in two teacher training colleges located in two different regions of Malawi. Specifically the study explored the following questions:

1) What are the discourse practices that mathematics teacher educators display in their descriptions of multilingual mathematics classrooms?

2) a) What are the discourse practices that mathematics teacher educators display in a college mathematics classroom?

   b) How do they make available the discourse practices for the student teachers to draw on?

Data was collected through pre-observation interviews, classroom observations, reflective interviews and focus group discussions with the mathematics teacher educators.

This study has shown that while there are some disconnections between the discourse practices produced in a school multilingual mathematics classroom and a college mathematics classroom, some of the discourse practices that mathematics teachers produced in a college mathematics classroom reinforces the common discourse practices being produced in multilingual mathematics classroom. There are three common discourse practices that were displayed in a college mathematics classroom. These discourse practices are: Initial-Response-Evaluation (Pimm, 1987), traditional lecturing and group discussions. I observed that the IRE and traditional lecturing discourse practices were accompanied by directive discourses for procedural control, and the procedural discourse was the prevalent discourse in all the discourse practices produced.

Three major themes have emerged from the data analysis. Firstly, the research findings indicate that the mathematics teacher educators regard multilingualism and the language practices that come with it such as code-switching more as a problem rather than a resource for teaching and learning. Secondly, code-switching in college mathematics classroom is not as spontaneous as is research shows it to be in schools; rather it is very much controlled and restricted. Thirdly, the dilemmas of code-switching as discussed by Adler (1998, 2001) are more acute in teacher training colleges, mainly because of the mismatch in the Language-in-Education Policy (LiEP) in schools and tertiary level.

Key words: Qualitative research design, Critical Discourse Analysis, discourse practices, mathematics teacher educators, initial teacher training colleges, multilingual classroom, code-switching, multilingualism, student teachers, college mathematics classroom, Initial-Response-Evaluation, traditional lecturing, group discussions, directive discourse, procedural discourse, school mathematics teaching.

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This thesis is dedicated to my husband, Felix and son, Lawrence, for their support over the long period of study.

Also to my beloved parents, Mr. & Mrs. Mnolo, who emphasized the value of education and had a great influence on my life.

GLOSSARY OF TERMS[1]

Additional language: Refers to any language which an individual adds to his or her first, main or home language (see below).

Bilingual/Multilingual: Refers to an individual who is proficient in two or more languages respectively.

Bilingual/Multilingual classroom: Refers to a situation where learners bring into a class a range of main languages. This does not imply that all learners and/or teachers in the class are themselves necessarily multilingual.

Code-switching: Means shifting from one code (i.e. language, dialect or language variety) to another between utterances or for a section of an utterance that is at least of sentence length. All forms of code-switching presuppose a speaker's sensitivity to different social contexts and conventions.

College teachers: In this thesis, this term refers to teacher educators in the initial teacher training colleges (see below).

College mathematics classroom: Refers to a mathematics classroom in the initial teacher training colleges.

Colonial language: Is used in this thesis to refer to languages that came with the colonizers of the country. For example, Malawi was a British colony and, as a result, English became and still is the *official language*. Thus, English in Malawi is a colonial language.

Discourse: This term refers to ways of using words, including the purpose to which the language is put.

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[1] Some of these definitions are taken from Adler (2001, pp. 163 - 166)

Discourse practice: This term in this thesis, refers to the whole process of social interaction which includes language forms (written and spoken), patterns of interaction among the participants, as well as the values embedded in the use of language and the power relations and attitudes to knowledge.

First language: Refers to a language that a child acquires from birth and in which he or she is most proficient. In some books terms such as *mother tongue* and *home language* are used instead of *first language.* In this thesis, I use the terms interchangeably.

Foreign language: Refers to any language which learners are likely to hear or read outside the classroom in which they are learning it because it is not in use in the wider community.

Home language: See *first language* above.

Initial teacher training colleges: Refers to colleges that prepare teachers for primary teaching.

Language across the curriculum: See *Language of learning and teaching* below.

Language of Learning and Teaching: Is the term that refers to language(s) used for both learning and teaching across the curriculum and gives equal importance to both learning and teaching. These terms can also be referred as "language of instruction" or "medium of instruction". In Malawi, the most common term used for the Language of Learning and Teaching is the *language across the curriculum* or *medium of instruction*. Thus, in this thesis, these two terms are used interchangeably.

Learner: In this study, learner refers to a school pupil. Note that, in this study, this term is used interchangeably with the word student (*see student below*)

Local language: See *first language* above.

Main language: Refers to the language most often used by an individual, in which he or she becomes proficient. Some people who are fully bilingual or multilingual (see above) may use two or more languages on an approximately equal basis and thus have

more than one main language. In some books, they use *primary language* to mean the main language. In this thesis, I use *main language* as opposed to *mother tongue*.

Mathematics teacher educators: Refers to college teachers (see college teachers above) that teach mathematics to *student teachers* (see student teachers below). In this thesis, the term teacher educators may be used instead of mathematics teacher educators.

Medium of instruction: See *language of learning and teaching* above.

Monolingual: Refers to an individual's native like proficiency in one language only, with negligible or no knowledge of a second language.

Mother tongue: See *first language* above.

Multilingual: Refers to the speakers' proficiency in more than two languages.

Multilingual mathematics classroom: Refers to a mathematics classroom where students bring a range of home languages. It does not imply that all students are multilingual. The meaning in this thesis is that there are more than two languages in the classroom.

National language: This is a language that represents the national identity of a nation and in most cases it is used for political and legal discourse. In Malawi, Chichewa is the national language.

Official language: Is a language that is given a unique legal status in a country. It is typically the language that is used in national legislative bodies. The official language is sometimes not the same as the language of learning and teaching and so the two are not interchangeable. In Malawi, the official language is English.

Student teachers: Individuals admitted to, or enrolled in, programs for the initial preparation as teachers: candidates in teacher education.

School mathematics: This refers to mathematics that is to be taught in schools.

Standard: Refers to a year of schooling. For example, Standard one means the first year of schooling.

Student teachers: This term refers to the *student teachers* (see above)

Teacher educators: See *mathematics teacher educators* above.

Texts: Refers to the written or spoken language produced in a discursive event.

Tutors: See *college teachers* above.

ABBREVIATIONS

BED	Bachelors degree in Education Science
CDA	Critical Discourse Analysis
CTTC	Chayamba Teacher Training College
GTZ	Gesellschaft für Technische Zusammenarbeit
IPTE	Initial Primary Teacher Education
KTTC	Kachere Teacher Training College
LiEP	Language-in-Education Policy
LoLT	Language of Learning and Teaching
MANEB	Malawi National Examinations Board
MASTEP	Malawi Special Teacher Education Program
MIITEP	Malawi Integrated In-service Teacher Education Program
MoESC	Ministry of Education, Sports and Culture
PCAR	Primary Curriculum Assessment Reform
PEAs	Primary Education Advisor
TTCs	Teacher Training Colleges
UNESCO	United Nations Educational, Scientific and Cultural Organization

Table of Contents

Declaration ..... **ii**

Abstract ..... **iii**

Acknowledgements ..... **v**

Dedications ..... **vi**

Glossary of terms ..... **vii**

Abbreviations ..... **xi**

List of figures ..... **xviii**

List of tables ..... **xix**

CHAPTER ONE: INTRODUCTION TO THE STUDY **1**

1.1 The problem develops 1

1.2 The research problem 2

1.3 Research aim, questions and theoretical orientation 3

1.4 Background to the study 4

1.4.1 Languages in Malawi 5

1.4.2 Language -in-Education Policy (LiEP) in Malawi 5

1.4.3 Primary Teacher Training Colleges (TTCs) in Malawi 6

1.4.4 The structure of the IPTE program 7

1.5 Why this study is relevant now 9

1.6 Outline of this thesis 11

CHAPTER TWO: MULTILINGUAL TEACHER EDUCATION IN AFRICA ...14

2.1 Introduction 14

2.2 Language-in-Education Policy in Africa.....15

2.2.1 Language of Learning and Teaching: colonial vs. local language…….15

2.2.2 Teaching and learning experiences when unfamiliar languages such as colonial languages are used as LoLT ……...16

2.2.3 Teaching and learning experiences when local languages are used as LoLT …...18

2.2.4 Colonial vs. local languages: teachers and students perceptions……...19

2.2.5 Colonial vs. local languages: Malawian context ……...20

2.2.6 Implications of LiEP on the teaching and learning mathematics ……..21

2.2.7 Concluding remarks on Language-in-Education Policy in Africa section ……23

2.3 Multilingual Teacher Education in Africa.....24

2.4 Conclusion.....30

CHAPTER THREE: MATHEMATICAL LANGUAGE AND THE TEACHING AND LEARNING MATHEMATICS IN MULTILINGUAL CLASSROOMS …31

3.1 Introduction 31

3.2 Mathematical language.....32

3.3 Teaching and learning mathematics in multilingual classrooms.....39

3.3.1 Code-switching …….40

3.3.2 Use of different discourse practices ……..50

3.4 Conclusion.....54

CHAPTER FOUR: THEORETICAL FRAMEWORK FOR INVESTIGATING DISCOURSE PRACTICES …….56

4.1 Introduction 56

4.2 Discourse practices for mathematics teaching 56

4.3 Critical Discourse Analysis (CDA), what it is and what it is for 59

4.4 Origins and key elements of Fairclough's CDA 61

4.5 Stages of analysis in CDA.....64

4.6 Exploring mathematics teacher educator's discourse practices through CDA…….69

4.7 Summary and conclusion 72

CHAPTER FIVE: RESEARCH DESIGN AND METHODOLOGY 74

5.1 Introduction 74

5.2 Research Design.....74

5.3 Data collection methods 76

5.3.1 Pre-observation interviews ……77

5.3.2 Classroom Observations ……79

5.3.3 Reflective Interviews ……80

5.3.4 Focus group discussions ……80

5.4 Research sampling and procedures 81

5.4.1 Teacher Training Colleges (TTCs) in Malawi ……..81

5.4.2 Selection of the participants ……84

5.5 Research process 92

5.6 Ethical considerations 98

5.7 Validity and reliability 99

5.7.1 Validity 100

5.7.2 Credibility 101

5.8 Limitations and generalisability of the study 101

5.9 Summary and conclusion 103

CHAPTER SIX: DATA ANALYSIS AND PRESENTATION 104

6.1 Introduction 104

6.2 Transcription 104

6.3 The process of data analysis 106

6.3.1 Level one: Textual analysis 106

6.3.2 Level two: Discourse practice analysis 109

6.3.3 Level three: Social process analysis 114

6.4 Conclusion 116

CHAPTER SEVEN: MATHEMATICS TEACHER EDUCATORS DISCOURSES ABOUT MULTILINGUAL CLASSROOMS 117

7.1 Introduction 117

7.2 Recap of background 118

7.3 The place of home languages in a college mathematics classroom 119

7.4 Solutions to the challenges that exist in multilingual mathematics classrooms, ...128

7.5 Mathematics teacher educators' talk: Policy and Practice 136

7.6 Conclusion 145

CHAPTER EIGHT: ANALYSIS OF COLLEGE MATHEMATICS CLASSROOM DISCOURSE ……148

8.1 Introduction 148

8.2 Framing the analysis: Directive discourse for procedural control.....150

8.3 Illustrating the directive discourse for procedural control in the IRE discourse practice …….151

8.4 Illustrating the directive discourse for procedural control in a traditional lecture discourse practice 162

8.5 Illustrating a procedural discourse in a group discussions discourse practice 170

8.6 Summary and conclusion 182

CHAPTER NINE: CONCLUSIONS AND RECOMMENDATIONS 185

9.1 Introduction 185

9.2 Discussion of results.....186

9.2.1 Code-switching in a college mathematics classroom ……..187

9.2.2 Dilemmas of code-switching in a college mathematics classroom ……189

9.2.3 Policy and practice in a college mathematics classroom ……191

9.2.4 Patterns of instructional strategies in a college mathematics classroom …….194

9.3 Recommendations 198

9.3.1 For the Ministry of Education and DTED ……...198

9.3.2 For mathematics teacher educators ……200

9.4 Directions for future research.....202

9.5 Conclusion.....204

References 205

Appendix A: Examples of pre-observation interviews.....226

Appendix B: Examples of the lessons observed.....268

Appendix C: Examples of reflective interviews.....332

Appendix D: Permission Letters.....349

Appendix E: Example of linguistic analysis of the data 362

List of Figures

Figure 3.1 Alternative routes from informal spoken (in main language) to formal written (in English) mathematical language ……..…….36

Figure 4.1 Fairclough's CDA model of the relationship of dimensions of discourse analysis to dimensions of discourse 67

List of tables

Table 1.1 Summary of structure of the IPTE program 8

Table 1.2 Summary of activities done in foundation Studies, Numeracy and Mathematics during the first year of the program 9

Table 2.1National policy on the LoLT in education and training policy of teachers of 1994 in Ethiopia 25

Table 2.2 Summary of structure of the IPTE program 26

Table5.1 Profile of mathematics teacher educators and their classes in summary 91

Table5.2 Dates of Pre-observation interviews..... 94

Table 5.3 Dates of Reflective Interviews 97

Table 6.1 Conventions used during transcription of the data used in this study 105

Table 6.2 Directives with varying degrees of authoritative 113

Table 8.1 Directives with varying degrees of authoritative 151

Table 9.1 Malawi National Policy on LoLT 191

Table 9.2 Teacher educators and student teachers practices in a mathematics college classroom……..... 192

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.1 The problem develops

In 1999, I graduated as a secondary mathematics teacher from the Univeristy of Malawi and started teaching in one of the secondary schools in the same year. Then from the year 2000, I started working as a mathematics teacher educator at The University of Malawi – The Polytechnic, preparing secondary school mathematics teachers. From my experience both as mathematics teacher and a mathematics teacher educator, I noticed that learners, even at college level, had difficulties in understanding mathematical concepts, especially when English as the Language of Learning and Teaching (LoLT) was used in my explanations. As a teacher, I struggled to find an appropriate way of explaining mathematical concepts in English to my learners. Sometimes I would change and use Chichewa (Malawi's national language) even though it was not allowed. My focus, however, was on getting the learners to understand what I was teaching because I would feel bad if I taught but nobody understood.

My experiences are not unique, they are similar to those of many mathematics teachers in mathematics classrooms in Malawi. Given such a scenario, the question arises: is there a way in which mathematics teacher educators can prepare mathematics teachers in initial teacher education programmes on what to do if they find themselves in classrooms where learners learn in a language that is not their home language? What is it that mathematics teacher educators offer now to equip student teachers for teaching in these classrooms? A majority of learners in government institutions in Malawi learn mathematics in English, which is their second or third language. Teaching and learning mathematics in a language that is not the first language of the learners and of the mathematics teacher is complex and can create dilemmas for teachers (Adler, 1998, 2001). These experiences and unanswered questions sparked my original interest in the field of language and mathematics.

1.2 The research problem

Studies conducted in primary mathematics classrooms in Malawi have shown that mathematics teachers who teach in the lower classes face a lot of language challenges when teaching mathematics (Chilora, 2000; Chilora & Harris, 2001; Chilora, Jessee & Heyman, 2003; Kaphesi, 2003, 2001). The new Language-in-Education Policy (LiEP) in Malawi which stipulates that learner's home languages should be used as LoLT for the first four years of primary school was introduced by the Ministry of Education in 1996. As a result, teachers in multilingual classrooms do not know which of the many languages in their classrooms to use and how to use them when teaching mathematics. The situation becomes more complex if the teacher is not fluent in the learners' home language(s) and/or if the learners speak different home languages. The question is: what does this situation mean for teacher education?

Most published research on teaching and learning mathematics in bilingual or multilingual classrooms does not focus on teacher education. For example studies conducted by Adler (2001), Moschkovich (1999, 2002) and Setati (2005b) focus on teaching and learning mathematics in multilingual classrooms. This research is useful in helping us understand the complexities of teaching and learning mathematics in bi/multilingual classrooms in which learners are still learning the LoLT. Furthermore, the published research describes the language practices that teachers in bi/multilingual classrooms use to deal with these complexities. However, this research does not assist us in understanding the language practices of mathematics teacher educators and how such practices could be used productively to enable the student teachers to learn how to support multilingual learners. Teaching mathematics in a bi/multilingual teacher education class is different from teaching mathematics in a multilingual school mathematics class. Teacher education focuses on knowledge for teaching and thus a relevant question to ask about teacher education is: what are the language practices surrounding the teaching of mathematics in bi/multilingual mathematics teacher education classrooms and how are they produced?

An assumption embedded in this study is that teaching student teachers how to teach mathematics in multilingual classrooms is complex, especially when the student teachers themselves are learning in a language that is not their first language. Another assumption is that mathematics teacher educators in multilingual classrooms are inevitably confronted with challenges because they are working with student teachers who are themselves learning to communicate mathematics in a language that is not their home, main or first language. Furthermore, the complexities that teacher educators in multilingual classrooms face are different from those faced by teachers in multilingual school mathematics classrooms. It is, therefore, against this background that the study sought to investigate and analyze the discourse practices of mathematics teacher educators in college mathematics classrooms. The term discourse practices refer to the whole process of social interaction between the mathematics teacher educators and the student teachers which includes language forms (written and spoken) which operate together with vocal and visual elements (Fairclough, 1989, 2003).

1.3 Research aim, questions and theoretical orientation

This research set out to investigate and analyze the discourse practices of the mathematics teacher educators in initial Teacher Training Colleges (TTCs) in Malawi. It examined specifically how discourse practices contribute towards preparing the student teachers to teach mathematics in primary multilingual mathematics classrooms. The following research questions are thus addressed in this study:

3) What are the discourse practices that mathematics teacher educators display in their descriptions of multilingual mathematics classrooms?

4) a) What are the discourse practices that mathematics teacher educators display in a college mathematics classroom?

   b) How do they make available the discourse practices for the student teachers to draw on?

This study was guided by the theory of Critical Discourse Analysis (CDA) which is presented in chapter 4. Briefly, CDA as used by Fairclough (2001) is a visible and

influential branch of discourse analysis, which is useful in analyzing the potential power and value of the words (either written or spoken) used by people in a community. The approach provides a theoretical frame that can be used to analyze how discourse symbolizes a community in particular interests and how discourse positions the members of the community and produces the relations of institutional power at work in classrooms. In this study, CDA will be used to explore the discourse practices of mathematics teacher educators in Malawi TTCs and how they are produced and displayed for the student teachers to draw on.

Using CDA helps to understand the fundamental ideological frameworks of the mathematics teacher educators and their discourse practices, especially in a multilingual setting where the LoLT is not the first, home or main language of both the mathematics teacher educators and the student teachers. What discourse practices do mathematics teacher educators produce and how do they make them available for the student teachers to draw on?

In this regard, therefore, the unit of analysis in this thesis is discourse practice. I argue that discourse practices are the manifestation of social constructions, ideologies and relations which express both the normative stabilization of and the radical changes that are taking place in social life, in particular their impact on social actors (Waller, 2006). Thus in order to understand, describe and interpret social constructions, ideologies and relations around a phenomenon, discourse practices should be an important unit of analysis for the social researcher. Fairclough (2003) argues that this is especially for those researchers attempting to locate as well as address possible negative impacts of the changes on the lives of social actors.

1.4 Background to the study

In this section I present the rationale for the study. First I discuss the background of the study. This part indicates why this study was undertaken in Malawi and why it focused on TTCs. Furthermore, I present a discussion of the relevance of the study now, and why it focused on discourse practices of mathematics teacher educators.

1.4.1 Languages in Malawi

Malawi is a country in the southern part of Africa. It shares borders with Zambia to the west, Tanzania to the north and Mozambique to the east and south-west. It has an estimated population of thirteen million where 50% of this population is under the age of fifteen and 47% represents the school going population. The country is divided into the Northern, Southern and Central regions and each region has a main language. In the Northern region the main language is Chitumbuka; the Southern region, Chichewa, Chiyao, Sena and Lomwe while the language of the Central region is Chichewa. In Malawi, English is the official language and Chichewa, which is spoken by about 50% of the population (Baldauf & Kaplan, 2004), is the national language. Besides these languages there are sixteen other indigenous languages.

1.4.2 Language-in-Education Policy (LiEP) in Malawi

The LiEP in Malawi has undergone tremendous changes depending on who was ruling the country. To begin with, Malawi was a British protectorate, until 1964, when she got her independence under the leadership of President Kamuzu Banda, who ruled until 1994. Over this period of 30 years, Malawi was a one party state. Before independence in 1964, the British adopted Nyanja as the official language and used the home languages of the people in the particular area as the LoLT during the first two years of school. During the one party rule, Chichewa became the national language and was adopted as the only LoLT for the first four years of schooling (standard 1 to 4) while English was the LoLT beginning from the fifth year of schooling (Chilora, 2000). Thus, learners in public schools had to learn mathematics through Chichewa irrespective of whether Chichewa was their home language or not. In 1994, Malawi became a multiparty state. This change in politics ushered in a multitude of progressive policy changes in education. A new Language-in-Education Policy, which required learners in the first four years of schooling to be taught in their home language, was introduced in 1996. The policy stipulates that:

> .. with immediate effect all standards 1, 2, 3 and 4 children in our schools be taught in their mother tongue or vernacular as a medium of instruction. (Secretary for Education's Letter, 1996, Ref. No. IN/2/14).

Thus, according to this LiEP, learners from standard 1 to 4 are supposed to learn mathematics in their home language. However, the Government policy still indicates that English remains the major LoLT for all the upper classes in primary, secondary (high) schools and tertiary education. Furthermore, while the LiEP stipulates that home languages should be used from standard 1 to 4; there is no specialization of training standard 1 to 4 teachers. This raises questions about language policy in teacher training colleges.

1.4.3 Primary Teacher Training Colleges (TTCs) in Malawi

Primary teacher training programmes in Malawi have undergone a number of structural changes since independence. Since 1964, primary teacher training was a two-year pre-service college based programme. The output of trained teachers from this programme was seen as not adequate to meet the demands for new teachers (Kunje & Chimombo, 1999). In 1987, a one-year teacher training programme was introduced with the aim of increasing the output of the TTCs within a short period of time. The programme was aimed at training all the unqualified but experienced teachers who were in the education system at that time (Stuart & Kunje, 2000). In 1990, another programme called Malawi Special Teacher Education Programme (MASTEP) was set up. This programme combined short residential courses, local seminars, and distance learning methods. The aim was to train the teachers on the job (Stuart & Kunje, 2000). The programme ran for 3 years but was discontinued after the government realized that the training was costly.

In 1994, basic education (standard 1 - 8) was made free. The aim was to give all pupils access to basic education. As a result, learner enrolment, in particular in lower primary school classes (standard 1 to 3) rose from 1.9 million to 3.2 million and this led to a shortage of teachers. The teacher/pupil ratio increased from 1: 35 to 1: 60 (Chilora, 2000). To meet the demand for more teachers, the Malawi government recruited a large number of unqualified teachers. Then, the challenge was to train the unqualified teachers within the shortest period of time. Therefore, in 1998, the two-year primary teacher-training programme called the Malawi Integrated In-service Teacher Education Programme (MIITEP) was introduced (Kunje, Lewin & Stuart, 2003). The programme

comprised two main phases; residential and school-based training. The residential training was administered over a period of four months and the school-based training for 20 months. During the school-based training, the student teachers were expected to teach while receiving guidance and support from the school, Primary Education Advisors (PEAs) and their teacher educators (Kunje *et al.,* 2003).

The current government has described the MIITEP programme as inadequate to meet the demands for sufficient and competent teachers (Ministry of Education, 2005). Research also showed that the student teachers were not prepared enough in several ways. For example, the majority of the student teachers selected had a Junior Certificate of Examinations (Form 2/Grade 8 certificate) with poor language skills and so struggled to cope with the course (Stuart & Kunje, 2000). Yet the course in the MIITEP programme did not include language skills.

The government of Malawi also argued that MITTEP failed to produce sufficient numbers of required teachers and thousands of untrained teachers recruited after the introduction of free primary education were still waiting for initial training (Ministry of Education, 2005). The government further argues that, to facilitate the learning process in formal schooling, there is a need for a sufficient number of well-qualified and competent teachers. To achieve this goal and address the issue of teacher shortfall, a new primary teacher-training programme called the Initial Primary Teacher Education (IPTE) was set up in 2005.

1.4.4 The structure of the IPTE programme

IPTE is a two year programme with two components: residential and school-based training. Unlike the MIITEP programme, the residential training for IPTE programme is carried out for a period of one year during the first year (that is from August of year x to July of year x + 1). This first year is divided into three terms. At the end of these three terms the student teachers write end of year examinations set by the Malawi National Examinations Board (MANEB). The school-based training is carried out in the second year in form of teaching practice, which is supervised and assessed by the head teacher,

the local Primary Education Advisor (PEA) and the teacher educators. Table 1.1 shows the summary of the structure of the IPTE programme.

Table 1.1: Summary of the structure of the IPTE programme

YEAR	ACTIVITIES
First year (August of year x to August of year x + 1)	- Student teachers stay in College. - Activities include: attending lectures, micro-teaching and doing projects - Assessment include: projects & assignments, assessed by Teacher educators - Final Examinations by MANEB during the third term
Second year (January to November)	Teaching practice in various primary schools

During the residential training, student teachers are expected to be fully conversant with the Foundation Studies and learning areas/subjects taught in primary schools. Foundation Studies is mainly concerned with general pedagogic knowledge which includes the technical skills of writing schemes of work and lesson plans, as well as introduction to different teaching methods and how to improvise and use various kinds of teaching/learning aids (Stuart & Kunje, 2000). The learning areas (subjects) include Agriculture, Science and Technology, Numeracy and Mathematics, Expressive Arts, Literacy and Languages (Chichewa and English), Social and Environmental Sciences, Life Skills and Religious Studies (Ministry of Education, 2004). The subject areas are those offered in the primary education in Malawi.

The IPTE Numeracy and Mathematics curriculum consists of both the subject content and the methodology. The curriculum is organized in such a way that mathematics teacher educators first teach a particular topic and then the teaching method for the topic. The focus of this study is on the discourse practices of the mathematics teacher educators as they teach both the subject and the methodology of the Numeracy and Mathematics in the IPTE programme. Table 1.2 illustrates the activities in Numeracy and Mathematics classrooms, during the first year of training.

Table 1.2: Summary of activities done in Numeracy and Mathematics during the first year of the programme

Subject	Activities
Numeracy and Mathematics	• Introducing a particular topic within the syllabus of Numeracy and Mathematics • Developing and exploring activities used when teaching that particular topic • Practicing how to teach that particular topic (Micro teaching) • Discussing possible errors that pupils make in the topic under discussion. • Discussing teaching and learning methods for that particular topic

1.5 Why this study is relevant now

Recent research in the area of language and mathematics reveals the need for this study. Firstly, the literature on language and mathematics pays attention to the language practices of school mathematics teachers in multilingual classrooms, for example, Adler, 2001; Khisty, 1995; Moschkovich, 1999, 2002; Setati, 2005b; Torbe & Shuard 1982. The challenges that the teachers face in mathematics classrooms are also well documented, as will be discussed in chapter 3. However, the detailed descriptions and analyses of the challenges and dilemmas that exist in multilingual mathematics classrooms are not accompanied by an in-depth examination of what transpires in mathematics teacher education. The emphasis by past research on the dilemmas and challenges of the mathematics teachers suggests the enormity of work that mathematics teacher educators have in preparing the mathematics teachers to teach in multilingual classrooms. Past research does not explicate how these mathematics teachers are prepared and what language practices they are exposed to during the pre-service teacher education. There is, therefore, a need for careful examination of discourse practices of the mathematics teacher educators in the mathematics classroom in teacher education.

Secondly, the change in LiEP in Malawi has implications for mathematics teaching and learning as described by Kaphesi (2003), and thus also implications for teacher

education. It is important to know whether the mathematics teacher educators are aware of this Language-in-Education Policy and what and how it affects their teaching of mathematics as they train the student teachers. Available Malawian literature only indicates the implications of primary and secondary mathematics teaching; nothing has been reported about the implications of the policy for teacher education and the discourse practices of mathematics teacher educators. Furthermore, there is little research that has focused on teacher education programmes in Malawi, in particular the language practices of the mathematics teacher educators. That in itself is worth noting: more research is thus needed to explore the language complexities that mathematics teacher educators meet as they teach mathematics in multilingual classrooms in which the student teachers are themselves learning in a language that is not their home, first or main language and are being educated to teach in similar multilingual classrooms.

Thirdly, as will be discussed in chapter 3, literature shows that, in most multilingual classrooms, mathematics teaching is mostly done through the IRE interaction that focuses on procedural discourse. However, Dufficy (2001) argues that different discourse practices encourage a child to practice constructing joint understandings of the world. Furthermore, August & Pease-Alvarez (1996) and Reyhner & Davison (1993) argue that, teachers can meet the needs of a wider variety of learners if multiple approaches (*discourses*) are used in a mathematics classroom. Rather than the teacher assuming control of knowledge and testing the child's "fitness" to that conception, the options provide for the potential of knowledge sharing. A question that now needs to be answered is: What forms of classroom discourse practices in college mathematics classrooms would help the mathematics teachers develop strategies that would help them in dealing with these challenges and helping the student teachers develop different strategies or discourse practices when they begin to teach? Thus insights into the discourse practices of mathematics teacher educators are important for both Malawi and other countries as the knowledge might provide insights into the discourse practices that are made available to student teachers to draw on during teacher education. It is therefore important to understand the discourse practices that mathematics teacher educators produce and how they can be productively used to support the student teachers.

Lastly, current studies on teacher education internationally (in the USA as well as in Africa), have focused on how the teacher training curriculum can be formulated to meet the challenges of integrating cultures, languages and values in education programmes (Alidou & Brock-Utne, 2005; Heugh, 2005; NEA, 2001; Poth, 1980). Even though these studies look at effective practices of teacher educators, they do not explore the discourse practices of mathematics teacher educators in mathematics classrooms. Kaphesi (2003) conducted one such study in Malawi. In his paper, he outlined the following challenges; inconsistency between the language of study and the language of instruction; uncertainty about the LoLT in mathematics; and inconsistency in the language across the curriculum (Kaphesi, 2003). However, teaching mathematics involves more than looking at effective teaching. Among other factors, it also encompasses the discourse practices of the mathematics teacher educators as they prepare the student teachers in teacher training education. Meaning that, mathematics teacher educators' discourse practices in college mathematics classrooms is also very crucial. This translates to enormous work that teacher educators have when training the student teachers. Looking at how important having the insights into the discourse practices in a college mathematics classrooms, it is therefore important that this research be done.

1.6 Outline of this thesis

This thesis is divided into 9 chapters. Chapter 1outlines how the problem developed, the aim of the research and the research questions, the theoretical orientations and the rationale for undertaking the study.

Chapters 2 and 3 present literature reviewed for this study. In *chapter 2* the review focuses on two main categories: the debates about the LiEP in Africa and the training of mathematics teachers for multilingual contexts. The literature review about the LiEP in Africa highlights the debates on the appropriate language to be used as LoLT in schools and the current position of LiEP in Africa. It also highlights some of the implications that the LiEP has for the teaching and learning of mathematics in a multilingual classroom and so too for teacher education classrooms. The multilingual teacher

training literature provides information on the position of African countries on multilingual teacher education.

Chapter 3 presents a review of the literature concerning the understanding of the mathematical language as used in this study, and mathematics teaching and learning in multilingual classrooms. The review in this chapter hinges on the challenges that exist in teaching and learning mathematics in multilingual classrooms.

Chapter 4 provides the theoretical framework underpinning the study. The framework developed in this chapter is shaped by Critical Discourse Analysis (CDA) drawn from Fairclough (1989, 2001, 2003).

Chapter 5 presents an account of the research design and the rationale for selecting a CDA methodology for this study. It also accounts for the ways in which the sample for this study emerged as well as the way in which interviews, classroom observations, and focus group discussions were used to gather and interpret data. This chapter also includes issues of validity, reliability and generalisability.

Chapter 6 outlines how the data was analyzed. The chapter also addresses the issue of how the transcriptions were made and an explanation of how I used CDA in the analysis of data presented in chapters seven and eight.

Chapter 7 presents an analysis of how the mathematics teacher educators describe a multilingual classroom, their views on the use of different languages in the classroom as well as their awareness of the challenges that mathematics teachers in primary multilingual classrooms meet in the teaching and learning of mathematics. Further, this chapter discusses the implications of LiEP in a college mathematics classroom.

Chapter 8 presents an analysis of the classroom discourse practices commonly used by the mathematics teacher educators in their mathematics classrooms. More particularly, it attempts to shed light on how the mathematics teacher educators expose the discourse practices required for mathematics teaching for student teachers to draw on.

Chapter 9 concludes with a discussion of the major findings of this study. Using the research questions posed in this study as an organizing device, this chapter focuses first on how the mathematics teacher educators construct a multilingual classroom and then the discourse practices as they prepare the student teachers for teaching mathematics in multilingual classrooms.

CHAPTER TWO

MULTILINGUAL TEACHER EDUCATION IN AFRICA

2.1 Introduction

The purpose of this chapter is to review the literature relevant to Language-in-Education Policy (LiEP) and how LiEP affects the teaching and learning of mathematics in classrooms. Literature on the position of African countries on multilingual teacher education is also reviewed. This literature is examined to provide clear understanding of the complications, the issues and dilemmas that come with the LiEPs that allow the home language(s) to be used as LoLTs in multilingual classrooms. Furthermore, the literature discussed in this chapter, shows that ignoring the issues of LiEP in teacher education might not help to achieve the current position of introducing the home language(s) of the learners as LoLT in schools. Thus among the considerations that are included in this chapter are the following:

- *Language-in-Education Policy (LiEP):* This review will serve to highlight the debates on the appropriate language to be used as the language of learning and teaching (LoLT) in schools and the current position of LiEPs in African countries in general and Malawi in particular. It will also serve to highlight some of the implications that LiEP has on the teaching and learning of mathematics in multilingual classrooms.

- *Multilingual teacher education in Africa:* Included in this area is an overview of recent research on preparing student teachers for multilingual classrooms in general. Through this literature one is able to understand the position of the African countries on multilingual teacher education.

A discussion on the relationship between the findings from this literature and this research study is also provided.

2.2 Language-in-Education Policy in Africa

This section briefly describes some of the debates on the appropriate language to be used for teaching and learning in classrooms in Africa and its implications on the teaching and learning of mathematics. This section is broken down into several subsections. The first subsection discusses the current debate about the appropriate language to be used as the LoLT. The second subsection provides teaching and learning experiences when unfamiliar language such as the colonial language is used as the LoLT, followed by teaching and learning experiences when local languages of the learners are used as LoLT. Thereafter, I present a discussion about teachers' and learners' perceptions concerning the use of colonial and local languages, followed by implications of the LiEP on the teaching and learning of mathematics. The last subsection is a summary of this section.

2.2.1 Language of Learning and Teaching: colonial vs. local language

There are many debates among researchers on the appropriate language to be used as LoLT, whether to use colonial languages or home language(s) of the learners. There are some that are in favor of colonial languages while others favor home languages. For those in favor of the former, the argument is that the use of colonial languages, for example English, Portuguese, and French, as LoLT has more benefits for the learners because these languages are often spoken widely elsewhere in the world. In addition, these languages are seen as a symbol of power, status and prestige (Baldauf & Kaplan, 2005; Gutierrez, 2002; Hameso, 1997; Pennycook, 1998; Setati, 2005a; Tollefson, 1991; Trewby & Fitchat, 2001). The colonial languages are mostly used to gain access to tertiary education, jobs and businesses, among other things valued in life.

Barkhuizen (2002) reports that, English has often been stated as the language of progress, development and economic success. Barkhuizen (2002) argues that, the African languages, despite large numbers of speakers, simply cannot compete with the status of English, and the aim of establishing a truly multilingual society in African countries, in the sense envisaged by politicians and language planners, is far from being achieved.

On the other hand, Hameso (2001) argues that while learning and knowing colonial languages is essential and beneficial, these languages do not need to serve as the LoLT in schools. He argues that colonial languages are the languages of a few in Africa and are used by academia and not the common people in society. He further argues that the foreignness of colonial languages has been a major contribution to the high dropout rate of learners from schools. The use of colonial languages is seen as a demotivating factor to education. Instead of bringing education closer to the people in a society it draws them away. For some, it seems that the use of colonial languages in education has partly made education irrelevant to the masses of the society (Hameso, 2001).

2.2.2 Teaching and learning experiences when unfamiliar languages such as colonial languages are used as LoLT

Studies related to LoLT issues in post-colonial Africa suggest that the use of unfamiliar languages such as English, French, and Portuguese as LoLT creates teaching and learning problems in African schools (GTZ, 2005; Poth, 1980). Classroom observations conducted in several countries in Africa (For example, Benin, Burkina Faso, Guinea-Bissau, Mali, Mozambique, Niger, South Africa, Togo, Tanzania, Ethiopia, Ghana, and Botswana) revealed that the use of unfamiliar languages makes teachers use traditional and teacher-centered teaching methods (Alidou & Brock-Utne, 2005). An analysis of classroom observations conducted in Tanzania and Malawi, for example, revealed that there were problems in communication between teachers and learners in a classroom where the language, which was foreign to both, was used as LoLT (Alidou & Brock-Utne, 2005). Most learners did not grasp and develop the mathematics register. In trying to help learners participate in classroom activities, most teachers code-switched between the learners' home language and the official LoLT, a practice which was not allowed, because the LoLT in classrooms was English. In the same study, Alidou & Brock-Utne (2005) reported that teachers were using coercive measures to force learners to speak in the foreign language. The learners were asked to stand in the class until the lesson was over and they had to wear "a symbol" around their necks indicating their incompetence. This was done to force learners to speak in the LoLT, which was not their home language.

My experience in both learning and teaching mathematics in English informs me that using English as LoLT prevents most of the learners from being active in class for fear of being embarrassed by the teacher or their fellow learners when they fail to speak in English. However, the use of both English and local languages also has its own problems, for example, a single word in my local language may translate into several English words.

However, these difficulties are not exclusive to learners; teachers themselves also encounter similar challenges. For example, a study conducted by Brock-Utne (2002) in Tanzania showed that teachers who conducted lessons in Kiswahili (their home language) were at ease in explaining the concepts and in their interaction with the learners in the classrooms while those who conducted classes in English experienced great difficulties in explaining concepts. Brock-Utne (2002) quotes Mwinsheikhe (2001, p. 57) that:

> Teachers had to abide to the rule of the study: to use one language only. However, one could easily see that teachers who taught by using English were exerting a great effort not to succumb to the temptation of code-switching.

Brock-Utne (2002) says that, though the language of instruction in secondary schools in Tanzania is supposed to be English, Tanzanian teachers often use quite a bit of Kiswahili. They code-switched frequently. Alderson & Ladbury (1990) report after their many observations in Tanzanian secondary school classes:

> We have observed science lessons in which English was used throughout …..the teacher's English was weak, he largely read aloud from prepared notes, the pupils were reluctant to respond and only did so inadequately, in monosyllables, and showed little evidence of having understood the teacher. (Alderson & Ladbury, 1990, p. 12)

As a result of the difficulties that teachers and learners experience when a language that is not their home language is used as LoLT, and after considering the benefits of learning in one's language, other organizations, such as the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the German Agency for Technical Cooperation (GTZ) have been in the forefront in promoting the use of home languages in African classrooms (GTZ, 2005). Recently, there has been a shift from the use of

colonial languages to home languages as LoLT for the first two to four years of schooling in language-in-education policies in some countries such as Kenya, Malawi, Burkina Faso, Mozambique and Mali due to the initiative of these two organizations. For example, in Namibia English is the official language. It is also the medium of instruction in education. As such, learners learn English as a subject from grades 1 to 3, and from Grade 4 it takes over from the local language as the medium of instruction and it continues to be the second language throughout the learner's learning period up to tertiary level. In Nigeria, The National Policy on Education (NPE) endorsed the need for every child to learn the language of the immediate environment (Aliyu, 2008).

2.2.3 Teaching and learning experiences when local languages are used as LoLT

According to Cummins (1981), Tikunoff (1985), and Wong-Fillmore & Valadez (1986), the use of learners' home language(s) has benefits on school progress particularly when it is used in the explanation of concepts and for clarification. The argument here is that learners learn best in the language that they understand better, and more than this, learning in a first language is beneficial for the acquisition of an additional language. That is, being good at your first language is an important requirement for learning other languages.

Brock-Utne (2002), Wong-Fillmore & Valadez (1986) and many more researchers report that, learners are more involved in the learning process and participate more actively in the classes where the home languages are used. For example, Brock-Utne (2002) reports that in Tanzanian classrooms, learners in the English taught class would immediately switch to Kiswahili in group discussions although they lowered their voices when the observer (teacher) quietly approached the group and group discussions were by far the liveliest activities during the lessons. When the learners were asked why they used Kiswahili and lowered their voices, this is what they would say:

> When you are discussing in the group you can not panic to use poor English (Form III student) (Mwinsheikhe, 2001, p. 64)

And another one said:

> Because for most of times the teacher is not here to say you that is not English (Form III student) (Mwinsheikhe, 2001, p. 64)

In Nigeria, Adekunle Aliyu (2008) reports that, from an experiment that he made to know the acceptability of mother tongue for teaching, he found out that learners preferred to learn in their own language instead of English, as they can express themselves better in their mother tongue. With regards to mathematics, specifically, Chilora (2000) and Coffland & Cuevas (1979) found a direct relationship between instruction in the learner's home language and high achievement in the subject.

2.2.4 Colonial vs. local languages: teachers and learners perceptions

Even though both learners and teachers admit that the use of English as the language of instruction in secondary school is problematic, yet some teachers and learners favor a continued use of English as the medium of instruction (Barkhuizen, 2002; Brock-Utne, 2002; Chilora, 2000). For example one of the learners from Tanzania said that:

> Sipendi Kiswahili kiwe lugha ya kufundishia katika shule za msingi mpaka Chuo Kikuu kwa sababu ni lugha ambayo naifahamu tayari (I don't want Kiswahili as medium of instruction from primary school up to University level because it is a language I know already) (Rubagumya, Jones, & Mwansoko,1999, p. 22)

It is clear from this quotation that learners want English as a medium of instruction because they want to learn English. This view supports what Phillipson (1999, p. 208) said in his paper that English is best taught monolingually; the ideal teacher of English is a native speaker; the earlier English is introduced, the better the results; the more English is taught, the better the results and, if other languages are used extensively, standards of English will drop. The learners also think that because they understand and speak Kiswahili they do not need to develop their knowledge of that language further. However, to become a proficient master of a foreign language, one also needs to expand the academic vocabulary in one's own language (Brock-Utne, 2002).

Barkhuizen (2002) examined high school learners ' perceptions of the status and role of Xhosa (an indigenous African language) and English in the educational context. The study surveyed 2825 learners in 26 high schools throughout the Eastern and Western Cape Provinces in South Africa. All the learners followed both the English Second Language (ESL) and the Xhosa First Language (XL1) syllabuses. The official medium

of instruction in the schools is English, although it is widely known and has been reported that much code-switching takes place between English and Xhosa (Peires, 1994). The author found out that most learners articulated the belief that speakers of African languages do not find it necessary to study their mother tongue at school because they can already speak it.

Similarly, in a South African context there have been strong reactions to the proposal of using the 11 home languages as the LoLT (Barkhuizen, 2002), most highlighting the impracticality of this. The LiEP in South Africa and other African countries promotes multilingualism by allowing the schools to use more than one language of learning and teaching (Setati, Adler, Reed, & Bapoo, 2001). Barkhuizen (2002) argues that this is so because debates on their implementation usually take place among language acquisition planners, politicians, educators and language researchers. Those often excluded from these discussions and decisions are the people who go to school and to work every day and who want to make a success of their lives, both economically and socially.

2.2.5 Colonial vs. local languages: Malawian context

The debate on whether to use colonial or local languages in schools is also on going in Malawi. Malawi, as said in chapter 1, was a British protectorate and uses the language of the colonizer as the official language and as the LoLT from the fifth year of schooling and above. Local languages are to be used as LoLT for the first four years of schooling. According to this policy, not only can Malawian teachers and learners in the first four years choose their LoLT, but there is a policy environment supportive of the use of languages other than the one favored as the LoLT in a school. While this LiEP is accepted as good in some quarters, it has not been well received by parents who argue that using the local languages as LoLT will not necessarily improve the performance of the learners. From what I have observed, they are of the view that all learners from the first year of schooling should be guaranteed access to the language of the colonizer (English). They argue that using local languages will bring down the quality of education and that learners perform better if they are good at English and so using English as LoLT from standard one will improve the performance of the learners. For

example the secretary general of the Teachers Union of Malawi (TUM), Lucien Chikadza (2006) singles out three reasons why the policy for Malawian children in lower primary levels to learn in local languages is not advisable. First, "Malawi does not have a specific language," he says. Secondly, the policy would entail the transferring of teachers based in areas where they come from, which could lead to unequal distribution of teachers. Thirdly, says Mr. Chikadza, Chichewa "has a shallow vocabulary to reflect actual meanings of words and terms in English."

Although this is so in Malawi, in theory, English is the only language to be spoken in classes from standard five; however, in practice other local languages are still spoken in many classrooms in and above standard five. This situation is not unexpected because using the learners' home language as LoLT has been associated with inferiority, among speakers of African languages.

However, the problem in Malawi seems to be that, there is a communication gap amongst three groups of Malawians: Malawian linguists and language researchers, the Malawian elite, and the general Malawian public. Linguists and researchers in Malawi and all over the world have consistently, over several decades, found that local languages are the best medium for education. This makes it possible for children to participate in their own learning, and to develop intellectual depth and conceptual breadth in what they are learning. This intellectual depth and conceptual breadth easily translates into innovation and creativity in society, opening up new possibilities for local and global solutions to problems.

2.2.6 Implications of LiEP on the teaching and learning mathematics

The Language-in-Education Policies in Africa, Malawi in particular, imply that mathematics teachers have to decide which language to use, how to use it and when. This implies that teachers in a classroom have to decide which language to use, more especially if it is a multilingual classroom, which is the case in most African classrooms. Teachers may prefer to use the colonial language, which will give their learners access to power and will prepare them for tertiary education (Setati, 2005a). However, to most learners in African classrooms, a colonial language is not their first,

home or main language and therefore it becomes difficult for them to understand the mathematics taught in that language.

The discussion of this literature raises the question of what the teacher should do in the mathematics classroom. Teachers would want to use learners' home language(s) to help their learners to understand mathematics. At the same time, they would want to teach in the colonial language to give their learners access to tertiary education. The dilemma now is: to what extent can they use the colonial or home language?

On the other hand, if learners speak different languages in the classroom, which language would a teacher use so that no one is disadvantaged? Given the fact that most mathematics classrooms are multilingual, some learners will certainly be disadvantaged. Therefore, the teacher has to make a choice in this regard, whether she or he chooses to use the language of some of the learners or the colonial language. However, given the importance of the task under discussion, the implications of the teacher's choice are that some pupils' achievement may improve while some may not. The challenge can be too wide for a teacher to negotiate. It is still debatable whether the teacher would manage to create an environment suitable for most pupils.

In the case where the home language is not an option as prescribed by the Language-in-Education Policy, the teacher may comply with the policy. According to Adler (2001), when learners are working in small groups, in most cases, if the language of learning and teaching is not their home language, they tend to communicate in their home language. In this situation, the teacher has to make a decision whether to command them to switch to the language of learning and teaching for the sake of complying with the Language-in-Education Policy or to let them continue to use their home languages for the sake of developing meaning. This situation is indeed difficult for the teacher, since, if he chooses to speak the home language of the learners, then they would expect that the teacher will be doing the same all the time. Unfortunately, it may be hard for the teacher to switch back later to the official language of teaching and learning. The prescribed LoLT in the Language-in-Education Policy therefore contributes to these dilemmas for mathematics teachers in a multilingual classroom.

2.2.7 Concluding remarks on Language-in-Education Policy in Africa section

The preceding discussion suggests that the LoLT is partly dependent on the Language-in-Education Policy, on teachers' skills and on the context of teaching and learning practice. Language choice for teachers also depends on what they perceive as the good of their learners. This suggests that being a mathematics teacher does not just involve acquiring new knowledge and new teaching methods but also involves understanding and the acceptance of new language-in-education policies and acquiring language for teaching. Setati's (2005b) recent study suggests that teachers are more concerned with providing the best instruction possible that will give learners access to power, higher education and jobs. In this case, teachers might ignore the LoLT as defined in the Language-in-Education Policy and use whatever they feel is important and helpful to their learners. The point here is not that teachers must stick to the LoLT only, but that they can also use their reasoning and other skills that they feel will help the learners to understand the mathematics being taught. At this point, questions that arise for me are: what are the views of mathematics teacher educators about the relationship between language and mathematics teaching and learning? What are their views about the Language-in-Education Policy and how do they interpret it? How does this LiEP affect them as they prepare the student teachers?

With all the issues and dilemmas that come with the LiEPs that allow the home language(s) as LoLTs, one wonders now: is there a question of how then are we going to help the teachers in implementing this language? What about in teacher education? One point worth noting is that it seems there is a division on the language issue between politicians and academics, and within the teachers and learners themselves. For example Brock-Utne (2002) conducted a series of interviews – all in Kiswahili – with policy makers, government officials and academics in Dar es Salaam. Brock-Utne (2002) reports that there are those who support the use of Kiswahili as the language of instruction in secondary school and the University and there are those who want to start with English as the language of instruction from first grade in primary school. Brock-Utne (2002) reports that, unfortunately, the second group had the most strength because they were backed up by powerful donors like the British Council, US-AID and the

World Bank. They would say things like “English is the language of development, of modernization, of science and technology”. There was no-one from outside of Tanzania that supported the position that Kiswahili ought to be the language of instruction in secondary school and university. Understanding the division is important in the debate on how African countries can focus on the way forward as to what should happen in teachers’ training programmes. Should they use home languages as they train the student teachers?

The next section presents the literature review on multilingual teacher training in Africa with the aim of seeing the extent to which these African governments have gone to train the teachers who will implement these policies in multilingual classrooms. The section also discusses how the literature relates to this study.

2.3 Multilingual Teacher Education in Africa

There has been a lot of research in this area albeit not much of it focuses on mathematics teacher education. For the purpose of this study the focus of the discussion that follows is on what is happening in teacher training institutions in some countries in Africa that have teacher training policies targeting teachers who are going to teach in bi/multilingual classrooms. In most countries, there is not much that is happening in training the teachers for bilingual classrooms, therefore, this section provides a discussion of countries such as Burkina Faso, Ethiopia, Niger, Ghana, and Malawi. Furthermore, this section indicates some of the programmes put in place by various countries in trying to prepare teachers for multilingual classrooms.

In Burkina Faso, teachers who receive regular pedagogical support from the University of Ouagadougou linguists and are familiarized with the first and official languages used as LoLT in schools are those teachers who teach Ecoles Bilingues (Brock-Utne & Alidou, 2005). Ecoles Bilingues, according to the authors, are learners (nine years or older) who have not had a chance to be enrolled in formal primary schools. Brock-Utne & Alidou further explain that these learners are more mature and have already developed full language skills in their home languages before enrolling in Ecoles Bilingue.

In Ethiopia, the LoLT for primary teachers who are being prepared to teach in the first four years of schooling in training colleges is the same as the LoLT for the first four years of schooling in primary schools (Mekonnen, 2005). The concern however, is that this LoLT for primary teachers is not followed in actual practice (Mekonnen, 2005).

In the case of Ethiopia, the education and training policy of teachers of 1994 (GTZ, 2005) stipulates that LoLT of different levels of education should be as follows:

Table 2.1: National policy on the language of learning and teaching in education and training of teachers in 1994 in Ethiopia. (From GTZ (2005) report p. 114)

Level of Education		**National policy on LoLT**
I	**Primary Education** • I cycle (Grade 1-4) • II cycle (Grade 5-8)	Mother tongues
II	**Secondary Education** • I cycle (Grade 9 - 10) • Preparatory (Grade 11 - 12)	English
III	**Primary Teachers' Education** • PTE for I cycle • PTE for II cycle	Mother tongues and English
IV	Secondary teachers' education	English

In table 2.1, it can be appreciated that, LoLT for primary teacher education is the same as LoLT for primary education. According to Mekonnen (2005), there is a concern, however, that this national policy is not followed in actual practice and that there is a mismatch between the LoLT of primary education of the second cycle (grades 5 - 8) and the LoLT of primary teacher education for the second cycle. For example, the LoLT for grades 5 – 8 is the mother tongue but the LoLT being used in the teacher education is just English. Table 2.2 shows this mismatch.

Table 2.2: From GTZ (2005) report on optimizing learning and Education in Africa – the Language Factor (p. 114)

Educational Level		**LoLT**
I	**Primary Education**	
	Grade 1 – 4	Mother tongue
	Grade 5 – 6	Mother tongue and English
	Grade 7 – 8	Mother tongue and English
II	**Primary Teachers' Education**	
	Grade 1 – 4	Mother tongue
	Grade 5 – 8	English

However, it is not clear whether the teacher educators teach the subjects in their own home languages as indicated in table 2.2. Table 2.2 shows that teacher training in local languages in Ethiopia and other countries is still a challenge. Although the policy in Ethiopia encourages the use of mother tongue languages in teacher training programmes, it is seen that teacher educators sometimes ignore the LoLT as defined in the Language-in-Education Policy and use whatever they feel is important and helpful for the student teachers. Without the teacher educators implementing the policy on the ground, student teachers will graduate with little or no knowledge of how to teach in their local languages.

This means that in addition to the Language-in-Education Policy that encourages the use of local languages in teacher training institutions, there is also a need for the deliberate move from the mathematics teacher educators themselves to use local languages as they prepare the student teachers. The point here is that mathematics teacher educators need also to use their reasoning and other skills that they feel will help in preparing the student teachers to teach in local languages. Moreover, teachers have to learn new methods, since teaching in the learners' first language differs considerably from teaching in a second or a foreign language.

In Niger, studies conducted by Chekaroua (2004) support the idea that multilingual teacher education is very important for teachers who are implementing the new Language-in-Education Policy. In her study, she found that school teachers who are transferred from monolingual schools to bilingual schools have a negative perception of learner-teacher interactions in bilingual schools. Chekaroua argues that this is so because they are used to controlling the classroom due to the use of a language which is unfamiliar to learners while trained bilingual teachers hold different views about the interactions. The main problem that Niger and other African countries have is that they have a significant number of untrained teachers (GTZ, 2005) to implement the new language-in-education policies. The majority of these teachers are those who are enthusiastic about teaching in mother tongue or new graduates from secondary schools who are waiting for other employment opportunities (Benson, 2002; Traore, 2001). According to Benson (2002), both categories of teachers receive very limited training in teaching using the mother tongue and have no adequate school-based support. But Alidou (2003) says strongly that these teachers, though enthusiastic, need to go for training in mother tongue and official languages:

> Teacher's enthusiasm cannot substitute for qualification required for teaching in mother tongues and official languages. Many bilingual teachers face serious professional challenges. They may be able to speak the LoLT, but they have not mastered reading and writing in that language. (Alidou, 2003, cited in GTZ, 2005, p. 120)

Even though Alidou (2003) emphasizes the point that teachers need to be trained in the mother tongue, the question is where are they going to be trained since most of African countries do not have teacher training programmes for the LiEPs that are being introduced? Introducing and implementing the LiEPs that encourages the use of local languages alone may not improve the performance of learners. To improve the learners' performance will also involve training teachers on how to implement the new LiEPs. It might be difficult for teachers to implement the new LiEP if they are not trained on how to teach in local languages.

In Ghana, Addabor (1996) states that there was no teacher training in mother tongue or in bilingual teaching methodology. However, Alidou & Brock-Utne (2005) reports that now there is GTZ that is working to strengthen teaching in local languages in many

teacher training colleges in the country. Therefore, as GTZ has done, since local language education in primary school is introduced gradually, teachers have to receive ongoing training for the subsequent classes they are going to teach, and at the same time new teachers have to be educated in using the local language for instruction.

In 1996, the Malawi government invested significantly in teacher training programmes to help teachers cope with the implementation of the then LoLT, which was Chichewa (Chilora, 2000). Teachers were trained in teaching in Chichewa as the LoLT. Textbooks were also produced in Chichewa except teachers' guides that were produced in English to accommodate teachers who were not fluent in Chichewa (Chilora, 2001). Although the new LiEP is in place, little has been done in teacher training colleges to help teachers cope with the implementation. It is not surprising, therefore, to see mathematics teachers struggling to cope with the demands of LoLT when teaching mathematics in bi/multilingual classrooms. Their prior educational experiences, including teacher training programmes, do not have proper training programmes in language practices as regards the LoLT. Teaching behavior is frequently moulded by prior educational experiences (Shiundu & Mohammed, 1996) and language practices are likely to emerge in schools if teacher education programmes engage their student teachers in language practices early in their career preparation. This is quite a challenge as noted by Gay & Ryan (1999). Gay & Ryan (1999) argue that student teachers bring into the programme their prior knowledge, beliefs and experiences, which affect their assimilation and construction of new knowledge. They continue to argue that teacher educators are themselves products of their own prior experiences in traditional settings. Therefore, it is crucial to study what happens in primary teacher education.

The research summarized in the foregoing section shows that there is an awareness of bi/multilingual teacher education and at least something is being done towards the move to bi/multilingual education. The literature shows, however, that African countries have not gone very far with teacher training in bi/multilingual education. Ngu (2004) who conducted a study on behalf of UNESCO argues that teacher-training programmes in most African countries were developed before the countries got political independence. This implies that student teachers are being prepared to teach all subjects including

mathematics, in languages that are unfamiliar to children (such as English, French, Spanish and Portuguese). Even in countries such as South Africa, where new teacher education programmes were developed after independence, student teachers are still being prepared to teach mathematics in English or Afrikaans only. With such teacher education programmes, teachers are likely to find it challenging to cope with teaching in multilingual classrooms in which learners are learning mathematics in a language that is not their home, first or main language.

It is also seen in Ethiopia, that, even though the LoLT in teacher education matches the LoLT in primary schools on paper, the policy is not fully implemented on the ground. Most countries do not even have bi/multilingual teacher training programmes, even though their language-in-education policies of mother tongue are being implemented. This highlights the major problem that Africa has in teacher training programmes. It shows that teacher training programmes are inadequate in the use of mother tongue as the LoLT (GTZ, 2005). The GTZ report says that, due to lack of adequate training, primary school student teachers do not know how to effectively teach, monitor and assess learners using mother tongue. The GTZ report continues to argue that in most cases teachers do not understand the phenomenon of bi/multilingualism education, and student teachers rely on previous language teaching methods and their own experience as student teachers to teach their learners (Alidou & Brock-Utne, 2005).

With such teacher education programmes, one wonders whether the student teachers are adequately prepared to teach using local languages and whether the teacher educators themselves first need to be sensitized and go for training on how they can teach the student teachers in local languages. It should be acknowledged, however, that several studies in multilingual teacher education stress the importance of and recommend the inclusion of bi/multilingualism in teacher training education. Teacher training institutions are important because that is where student teachers acquire the skills needed to implement educational policies. Teacher training institutions in African countries bring together student teachers from all linguistic communities of the country, which means that they have some knowledge of education language policy (Poth, 1980). Therefore, as their training institutions help them to conceptualize this

knowledge, Poth argues that they are in a better position to teach effectively and therefore implement language-in-education policies effectively on the ground. Thus this research investigated what really happens in primary teacher education.

2.4 Conclusion

Drawing from the literature discussed it can be pointed out that, teacher training programmes in most countries in Africa have not yet developed multilingual training for teachers and there is a need to revise the teacher training programmes in order to integrate bi/multilingual education and the training needs of bilingual teachers. In countries where mother tongue is the LoLT, the contents of teacher training programmes must also focus on bi/multilingualism in preparing future teachers (GTZ, 2005). The choice of the LoLT gives rise to strong reactions from parents, pupils, and teachers. The use of mother tongue does not imply the exclusion of foreign languages. In fact in most African countries where the use of mother tongues as the LoLT is underway, foreign languages are still vital in the curricula (Poth, 1980). In this context, teacher-training institutions must take bi/multilingualism as its starting point in its activities. However, it still remains to be seen what mathematics teacher educators do as they prepare the student teachers to teach mathematics in multilingual contexts.

The next chapter provides the literature on mathematical language as understood in this study as well as the challenges that arise during the teaching and learning of mathematics in a multilingual classroom.

CHAPTER THREE

MATHEMATICAL LANGUAGE AND THE TEACHING AND LEARNING OF MATHEMATICS IN MULTILINGUAL CLASSROOMS

3.1 Introduction

In chapter 2, I presented the literature relevant to Language-in-Education Policy (LiEP) and how it affects the teaching and learning of mathematics in classrooms. I argued that the LoLT is partly dependent on the Language-in-Education Policy, on teachers' skills and on the context of teaching and learning practice. Language choice for teachers also depends on what they perceive as good for their learners. Furthermore, I discussed literature on the position of African countries on multilingual teacher education. Teacher training programmes in most countries in Africa have not yet developed multilingual training for teachers and I argued that there is a need to revise the teacher training programmes in order to integrate bi/multilingual education and the training needs of bilingual teachers.

This chapter presents a detailed account of the literature concerning mathematics teaching and learning in multilingual classrooms. The literature on mathematics teaching and learning in multilingual classrooms pays attention to the language practices of primary school mathematics teachers and the challenges that these teachers meet as they teach. The purpose of this chapter is to present a critical review of this literature, which shows the connections between the findings from this literature and how it relates to the discourse practices of the mathematics teacher educators in initial teacher training colleges. Thus included in this chapter are the following areas:

- *Mathematical language*: The discussion on mathematical language serves to highlight the understanding of mathematical language in this study, and further shows the different implications of mathematical language over the teaching and learning of mathematics.

- *Mathematics teaching and learning in multilingual classrooms.* The literature regarding teaching and learning mathematics in multilingual classrooms in this chapter highlights the challenges that mathematics teachers meet in multilingual classrooms as raised in recent research. It also discusses the different language practices that mathematics teachers use to overcome these challenges. This literature is reviewed in order to give a deeper understanding of the language complexities in a mathematics multilingual classroom. It also shows that dealing with these issues without considering the discourse practices of the mathematics teacher educators in teacher training colleges may not be enough to attend to the challenges that exist in multilingual classrooms.

3.2 Mathematical language

This section briefly describes what I mean by mathematical language. It also presents a discussion about the implications of mathematical language over the teaching and learning mathematics in multilingual classrooms. Furthermore, the section also discusses other issues such as the formal and informal mathematical language that needs to be considered in a mathematics classroom.

Pimm (1991) explains that there are many different relationships that can be highlighted between mathematics and language. Mathematics has its own register (Halliday, 1975; Pirie, 1998), rules, grammar, syntax, vocabulary, word order, synonyms, negations, conventions, abbreviations, sentence structure, and paragraph structure (Esty & Teppo, 1994, p. 1). Halliday (1975) specifies the notion of register as ‘a set of meanings that is appropriate to a particular function of language, together with the words and structures which express these meanings’. Lee & Fradd (1998) explain that appropriate use of key mathematical terminology is an indicator of the precision and sophistication of understanding. Therefore, part of learning mathematics is gaining control over the mathematics register so that one is able to talk like a mathematician (Pimm, 1991).

The mathematical language adds on to the complexity of teaching and learning mathematics in multilingual classroom in different ways. For example, mathematical language differs from the ordinary language in different ways. Mathematical language

has certain language features, for example, that cannot be matched with other languages. Halliday (1975) gives an example that "four from six leaves two" when interpreted is "6 – 4 = 2". In addition, mathematical language includes everyday vocabulary that takes on a different meaning in mathematics; for example, words like *set, point, table,* and *altogether* (Halliday, 1975). Learners are expected to know and become familiar with this type of language, which they have to learn from the mathematics teachers in their classrooms.

Moreover, Morgan (1998) and Pimm (1991) explains that, while mathematics, when spoken, emerges in a natural language, when written, it makes varied use of a complex, rule-governed writing system mainly separate from that of the natural language into which it can be read. Such mathematical encoding includes symbol order, position, relative size and orientation (Pimm, 1991). Morgan (1998) calls this "writing system" as "mathematical academic writing" (p. 11). Which means that, teachers in a mathematics classroom have the duty of helping their learners to write mathematically that is, using symbols in a correct order. Furthermore, learners may attempt to read, write and understand the mathematical sentences in the same way that they read, write and understand standard narrative text. Learners may try to translate word by word between mathematical concepts and, in most cases, in a linear translation. One-to-one linear translations are not always appropriate since the way some mathematical concepts are expressed in words differs in its order from the way the concept is expressed in symbols. For example, *the number a is five less than the number b*, which the learner may mistakenly restate as $a = 5 - b$ when it should be $a = b - 5$ (Jarrett, 1999).

Furthermore, mathematical concepts sometimes are made up of the relationship between two words, which are hard to understand and at the same time require the use of symbols in solving the problem. For example, phrases like 'all numbers greater/less than X'. In the context of mathematics, "symbols can help to show structure, allow routine manipulations to become automatic and make reflection possible, by putting thoughts that one has with some stability, compactness and permanence, as objects which may be examined" (Pimm, 1991, p. 19). However, Pimm argues that the 'concreteness' of the symbols and the absence of obvious mathematical objects to act as

referents can lead many pupils to believe that the symbols are the mathematical objects. The technique of describing algorithms in terms of attributes of the symbols adds to the potential confusion.

Apart from the need for learners to be skilled in mathematical vocabulary and the mathematical writing system, learners will also be required to know the logical connectives (Dawe, 1983) in mathematical language. Mathematical language is mostly linked with connectors such as *if... then, if and only if, because, and either... or* which signal relationships between parts of a mathematical text. These words signal similarity or contradiction, cause and effect, reason and result, chronological or logical sequence (Jarrett, 1999). These words also serve to link propositions in reasoned argument (Dawe, 1983). Dawe states that, knowledge of logical connectives is so important, more especially for achievement on a mathematical test. Therefore, Dawe argues that, the development of the ability to use logical connectives for reasoning and argument is an important task for mathematics and science teachers. Thus mathematics teachers have an important task of helping their learners develop the ability to be able to use and interpret these logical connectors.

As can be seen from the mathematical language alone, teachers have an enormous task in trying to get their learners to learn mathematics, thereby accomplishing their education objectives in a mathematics classroom. These challenges take on added significance in the context where the language of learning and teaching is not the home language of both the learners and teachers. Most of the things mentioned in the preceding section are easily done if the LoLT is the home language of both the learners and the teachers. However, in most African classrooms and Malawi in particular, the LoLT is English which makes the teaching of mathematics even harder. There are many issues that emerge as they teach and that should be of concern. One of the issues is how mathematics teachers can make mathematics more comprehensible to their learners' more especially those whose home language is different from the LoLT.

As pointed out earlier, it is not only the mathematical language that matters in a multilingual classroom. There is also an issue of learners moving from informal to

formal mathematical language that needs to be considered in a mathematics classroom as discussed in the following section.

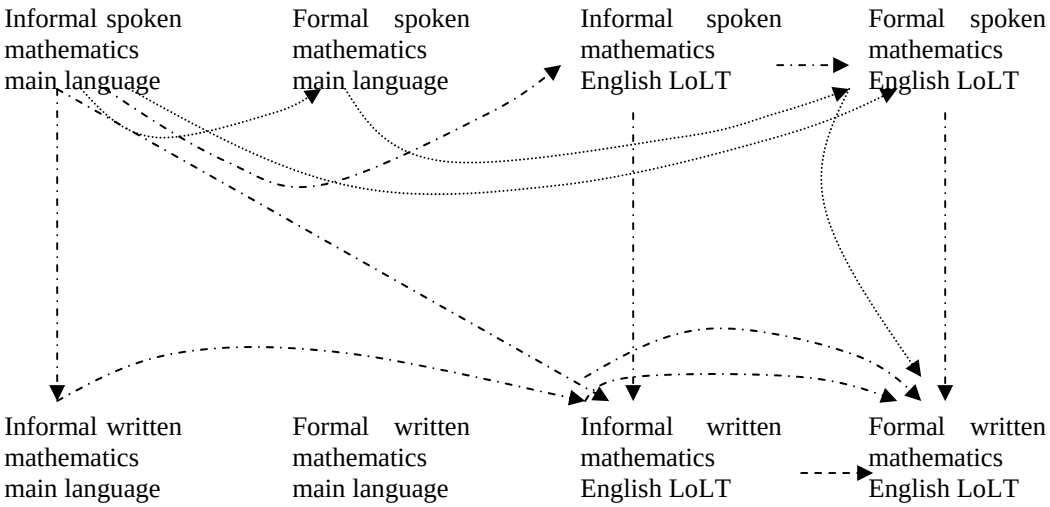
Moving from informal to formal mathematical language

In a mathematics classroom, mathematics learning involves both informal and formal components (Setati & Adler, 2000). The language that people use to express mathematics in their everyday life is referred to as informal mathematical language and the standard use of terminology developed within a formal setting as formal mathematical language. Pimm (1987) explains that learners do not commonly explicitly hear or read much mathematics outside the classroom and so the mathematical language that they bring to a mathematics class is informal. In school settings, it is the formal mathematical language that is valued. Therefore, learners need to learn the distinction between the informal and formal way of talking mathematics. Learners learn formal mathematical language in a mathematics classroom through their mathematics teachers. In this case, it is the mathematics teacher in a mathematics classroom who acts as a model of how to speak mathematically for the learners. Hence one thing that a learner does in a mathematics classroom is to learn a range of accepted ways in which mathematics is to be communicated and discussed through their mathematics teacher. This presents mathematics teachers with a big task of taking the learner from an informal way of talking mathematics to a formal one. The challenge therefore, is for teachers to help learners to move from the use of informal to formal mathematical language in a mathematics classroom.

Pimm (1991) explains the two levels of which mathematics teachers may help their learners to move from informal mathematical language to formal mathematical language: to encourage learners to write down their informal mathematical language and then work on this language to formal mathematical language; and to work on the spoken informal language to a formal spoken language and then formal written language. However, Setati & Adler (2000) suggest that movement from informal to formal mathematical language in a multilingual classroom may go through three routes:

from spoken to written language; from main language to English; and from informal to formal mathematical language. This is shown in figure 3.1.

Figure 3.1: Alternative routes from informal spoken (in main language) to formal written (in English) mathematical language (Adapted from Setati & Adler, 2000, p. 250)



Setati & Adler (2000) continues to argue that one way is to encourage learners to write down their informal utterances in the main language, then write them in informal mathematical English and finally to work on making the written mathematical English more formal. In this case, the mathematics teacher works first on learners' writing their informal mathematical thinking in both languages, and thereafter on formalizing and translating the written mathematics into the LoLT. Another possibility is to work first on translating the informal spoken mathematical language into spoken English and then to work on formalizing and writing the mathematics. Setati & Adler (2000) continue to argue that, while formal written mathematics in the learners' main language(s) is possible, there is a variety of reasons why most multilingual teachers would not work on formalizing spoken and written mathematics in their main language because of (i) the mathematics register is not well developed in most of the African languages and (ii) due to the dominance of English this would generally be seen/interpreted as a waste of time. This reflects the huge work that mathematics teachers have in a multilingual

classroom, helping learners to be able to use mathematical language in a language that is not their home or first language, and at the same time, they should be helped to move from informal to formal way of talking mathematics.

Moschkovich (1999) explains another way of how a teacher in a bilingual mathematics classroom in the USA supported the mathematical communication of his learners. The teacher supported the learners by revoicing, interpreting and rephrasing what learners were saying. For example, in the class that she was conducting her study, the teacher asked the learners to tell her something about a rectangle that is different from a triangle. One of the learners said that "the rectangle has a parallelogram and triangle does not have parallelogram" (p. 14). The teacher revoiced the learner's statement as "this is not a parallelogram" (p. 14) meaning the triangle is not a parallelogram. In her paper, she indicates that revoicing kept the discussion mathematical. Thus, teachers in a multilingual classroom can revoice, interpret and rephrase the learners' informal mathematical statements to formal mathematical language, thereby enabling learners to move from everyday language to a formal mathematical language in a classroom. The difficulty is, however, that sometimes a teacher and a learner may speak from different points of view (Moschkovich, 1999, p. 15). Furthermore, how do the teachers rephrase or revoice the learners, utterances in order to avoid embarrassing or exposing the learners or changing the meaning of the learners' response so that the revoicing should not discourage the learners in trying to express themselves? What should the teacher focus on: what the learner says, how it is said, or both?

Another way of helping learners, as explained by Halai (2001), is that teachers may prepare tasks that are set using the language and everyday life experiences of the learners. The assumption is that using the learners' language and everyday situations may facilitate learning and ease the need for translation. However, the use of everyday language in preparing tasks for the learners may lead to more difficulties and challenges, especially if the teacher ignores some of the unquestioned assumptions. Everyday language varies from learner to learner in a classroom because of reasons such as differences in age, stage of understanding, and exposure or background. Learners might come up with different meanings among themselves and also meanings

different from the teacher's since familiarity with the LoLT is not the same for all the learners in the class. The challenge for a teacher is how to find "a balanced language and experiences" to fit all age groups with different language backgrounds in a mathematics classroom. All this requires a great deal of the teacher's own "best" judgements. Another problem might be that everyday language for some learners, whether at school or at home, may not have prepared them for the kind of problems that they meet. For example some learners may want to be told and be directed rather than to do things on their own.

This literature shows that the teacher mediates between the learners and the mathematical language. However, a crucial part in this process of helping learners to move from informal to formal mathematical language is how much attention should be paid to the mathematics register and the LoLT so as to help learners move from the informal way of talking mathematics to a formal way? Khisty (1993) investigated how language was used by teachers to introduce new mathematical concepts to limited English proficient (LEP) and non-English proficient (NEP) learners. In her study, she noted that teachers gave little attention to the mathematics register. Khisty explains that very few mathematical words were actually spoken even though they would open the day's lesson with an obvious naming of the objectives of their lessons such as "adding like fractions" or "adding decimals". Khisty observed that, apart from these initial introductory statements and occasional corrections or affirmations of learner responses to problems, few mathematical words or sentences were said. She further explains that the teacher's talk would contain few mathematical words or incomplete sentences or ambiguous phrases. She gives an example that the teachers often would read quantities as a series of single digits as in the case of: "Add one, three, seven, and eighty-two" instead of "Add one hundred and thirty-seven and eighty-two" (137 + 82). The question that arises from this insight is: how much attention should a teacher give to mathematical language in a mathematics classroom? Are the teachers themselves well aware of this situation? What about mathematics teacher educators?

This research implies that teaching and learning mathematics is difficult and means a lot of work for teachers to help their learners to gain relevant knowledge of mathematical

language which includes its register, procedures, terms and concepts. Learners also need to be helped to use the language to work effectively together, to share and negotiate meanings in their classrooms. It has been shown that, the issue of mathematical language has different implications in the teaching and learning of mathematics.

This literature provides insights and raises some questions regarding helping the mathematics teachers to see how they can help their learners move from informal mathematical language to formal mathematical language. First, what knowledge and skills do mathematics teachers need in order to be able to mediate between their learner's informal mathematical language and formal mathematical language? In the next section, I present a further discussion of how complex it is to teach mathematics in multilingual classrooms and some of the strategies that teachers use to overcome the challenges that they face in these classrooms.

3.3 Teaching and learning mathematics in multilingual classrooms

Research suggests that teaching and learning mathematics in multilingual classrooms is complex (Adler, 2001; Chilora, 2000; Chilora & Harris, 2001; Chilora, *et al*., 2003; Halai, 2001; Kaphesi, 2001, 2003; Khisty, 1995; Moschkovich, 1999, 2002; Pirie, 1998; Setati, 2002, 2005b; Setati & Adler, 2000). This complexity, as discussed in chapter 2, section 2. 2, as well as section 3.2 is as a result of the nature of the mathematical language and that, in most mathematics classrooms, the LoLT being used is different from the first, main or home language of both the teachers and learners.

As seen from the literature reviewed in chapter 2, it is both teachers and learners who experience challenges when a language that is not their first, main or home language is used as LoLT. Brock-Utne (2002) explains that, when teachers have problems expressing themselves, learners have even more problems understanding the teacher’s explanations. Then, how do teachers cope in the multilingual mathematics classrooms? There could be different strategies that mathematics teachers use in order to cope with the challenges that they meet in a multilingual classroom. However, in relation to the study being discussed here, in this section, I will present two strategies that teachers use: (i) code-switching and (ii) use of different discourse practices.

3.3.1 Code-switching

Code-switching refers to the use of two or more languages in the same conversation (Adler, 2001). This practice can be done by the teachers themselves and/or the learners, between the LoLT and the learners' home languages. According to Baker (1993) code-switching can be developed as a teaching method which gets teachers to balance the use of the two languages at specific points within a lesson. For instance, switching to the learners' home language(s) can be done when a new concept is met, or to praise, to quote someone, to emphasize a point, or to reprimand a misbehaving member of the class. Code-switching can also be exploited as part of actual teaching methodology especially when the teacher knows the learners' home language(s) (Cook, 1991). This implies that code-switching is to be anticipated in the classroom if the teacher and learners share the same home or main languages.

Research shows that code-switching is a common phenomenon in multilingual classrooms. For example, in Tanzanian classrooms, teachers often mix Kiswahili and English words in their sentences. Mwinsheikhe tells from her own Science teaching experience in secondary school in Tanzania:

> I personally was compelled to switch to Kiswahili by a sense of helplessness born of the inability to make students understand the subject matter by using English (Mwinsheikhe, 2001, p. 16)

In other countries such as South Africa (Setati, 2005b) and Brunei (Martin, 1996) code-switching has been observed as the main linguistic feature in classrooms where the teacher and the learners share a common language, but had to use an additional language for learning. Cleghorn (1992), in a study of primary level science classes in Kenya, found a complex pattern of code-switching. She argues that important ideas were more easily conveyed when the teacher did not adhere strictly to the English only (p. 311). Murillo's (2005) study that focused on the discourse practices of the Spanish language teacher and her 24 pupils aged 14 during a particular teaching/learning event in London found that the teachers sometimes code-switched during their teaching. This confirms the fact that code-switching is a common phenomenon in bi/multilingual classrooms.

Setati's (2005b) analysis on language practices in multilingual primary mathematics classrooms shows that code-switching is encouraged, and that the learners' home languages can be a resource and not a problem in the teaching and learning of mathematics. For example, the teacher introduces a topic in English and then gives further explanation in the learners' first language. The use of the learners' home languages in teaching and learning mathematics needs to be seen as a support needed while learners continue to develop proficiency in the LoLT, at the same time as learning mathematics. This may be seen as a resource and not as a problem, helping the learner get a deeper understanding of the mathematics being taught.

Code-switching in a multilingual classroom, however, might not be an easy task for teachers in a mathematics classroom. As Akindele & Letsoela (2001) note, code-switching has its merits and demerits depending on how well prepared for the lesson the teacher is. In Khisty's (1993) study, teachers felt strongly about the need to use the two languages in their teaching. The method they used in their teaching was a code-switching involving concurrent translation approach. Khisty argues that this method made their speech very confusing as one of the teachers consistently code-switched very rapidly between the two languages, Spanish and English. Khisty reports that these teachers thought that the only method that was practical to use in their classrooms was concurrent translation approach, even though they easily became fatigued switching back and forth. The teachers had not thought about other possibilities for organizing instruction for the different languages. This shows that code-switching can be a complex task for mathematics teachers in a multilingual classroom more especially if they are not fluent in the learners' home languages. It is an issue that needs serious consideration and teachers need to have time to organize instruction for different languages.

Code-switching in a mathematics classroom can be used for a number of purposes such as re-explaining the mathematical concepts or difficult concepts in the learners' home language(s). Guthrie's (1984) study considered in detail the interaction and language use of two teachers with a group of Chinese-American first graders. In his study, he found out that knowledge of the learners' first language helped the teacher as both the

learners and the teachers could switch between the home language of the learners and the language of teaching and learning.

To unpack some of the functions of code-switching involved in the teaching and learning of mathematics in a multilingual classroom below, I present some of the following functions of code-switching according to Guthrie (1984, p.45). (i) Translation, (ii) for acting as a "we-code" (iii) clarification (iv) checking for understanding, and (v) giving procedures and directions.

Translation

In his study, Guthrie (1984) explains that the home language of the learners was used to translate particular English words which learners appeared not to know or which were obviously beyond the range of their vocabulary. This is done in order to ensure that learners have understood what the teacher is teaching. He gives an example of the word "aisles" of which the teacher provided the Chinese equivalent word in order to maintain learners' understanding. In some instances, learners' terminology in their own home language can help them to decipher meaning.

The process of translation, however, does not only happen when the teachers want to explain some words to their learners in a multilingual classroom. Learners also express mathematical thinking in their own language. For example, Orton (1992) explains that the language used for thinking is likely to be the first or home language. In Orton's view we can assume that a learner has to translate the given mathematical statement or problem to his/her home language before solving the problem. Another example is where Halai (2001) explains that, while teachers were using everyday words in English, the learners translated these everyday words into their first language. This scenario compounded the issue of transfer from the everyday language to mathematical language.

This process of translation requires that learners have to understand the language in which the problem is given to make sense of the mathematics embedded in it (Halai, 2001). In her study, Halai observed that, for learners to understand a mathematical

statement, they need to understand the language in which the problem is given. The language that is being referred to here is the specific structure and usage of words. In as much as this can pose a problem to the learner whose main language is the same as LoLT, it is more difficult for the learner whose main language is different from the LoLT. A learner whose main language is different from the LoLT needs to understand the language in which the problem is given (LoLT) before s/he can understand the mathematics in it. Halai (2001, p. 3) illustrates this situation of understanding the language to make sense of the mathematics. She gives an example of a class where most learners were Urdu-speakers who were given a mathematical problem in English (LoLT), which stated that: "Sara will be 28 years old after nine years. Find her present age." Halai showed that the learners' understanding of the problem depended on the learners' understanding of the meaning of the word 'will'. For learners to successfully convert the statement into a mathematical equation knowing that 'will' is future tense was crucial. Those learners who could not understand this word failed to come up with the mathematical equation, while those who understood it obtained the correct answers. This is a clear indication that the understanding of a specific structure and usage of words in mathematics is crucial.

This issue of translation in multilingual classrooms cannot be avoided as most of the classrooms are expected to follow prescribed textbooks which are mostly used to guide the subject content as well as providing exercises for practice. The issue being raised here is about the language that has been used in the textbook and the language of the learners. Learners whose home language is not English are bound to translate the English words into their home languages. The challenge in most African countries, for example Malawi, is that currently there is no meaningful production of teaching and reading materials for the teachers and learners in home languages in most subjects including mathematics.

The translation process, though helpful, has its own challenges. For instance, some English words can become more complicated when words are not translatable between English and the home language of the learners. Some terms may not exist across languages, or if they do exist, they may not be used with the same frequency or manner.

At the same time, one word in a home language may be translated into many different English words. For example, in Malawi, the words “above”, “over”, “top” and “up” all have one Chichewa name “*pamwamba*” (Kazima, 2006). So the process of translation is complicated and the possibility of every learner coming up with meanings different from the meaning of the teacher or “true” meaning is very high. Apart from that, it is difficult to find an appropriate mathematical language in some indigenous languages since the mathematical vocabulary is not yet well developed in most cases. This means that there can be a possibility of getting a word that has a different meaning from the actual meaning of the English mathematical word.

In a study of the effectiveness of code-switching in the classroom, Akindele & Letsoela (2001) demonstrated how teachers in their sample made gross errors in their code-switching and translations from English to the home language of the learners, which, because of the highly technical nature of the discourse, misled learners during teaching. The teachers argued that the problem was caused by the fact that translation is a specialist skill which teacher preparation programmes do not provide student teachers. Despite this problem, code-switching and translation remain the immediate resource in such classrooms even when it is clear that speaking one's language is one thing; the ability to translate and explain concepts in English is another.

The other challenge in the process of translation is to ensure that mathematics is not diluted or watered down. In some cases learners may give the impression that they do not understand the words when they simply lack specific language or communication patterns to express precise meanings (Jarrett, 1999 p. 16). One wonders if mathematics teachers need to pay specific attention to translation in a mathematics classroom. Do the mathematics teachers need to teach vocabulary as part of their core instruction, not as a separate activity? What is the best way to support vocabulary learning in this case?

The discussion highlights the fact that translation in a multilingual mathematics classroom is inevitable. Teachers in general have to face this challenge in one way or another as the LoLT and the language of the textbooks used is not the first language of the learners. They need to assist their learners to understand the mathematics that they

are teaching. This is a huge challenge and its demands can affect mathematics teachers' practices in different ways and the mathematics teacher educators as well.

For acting as a "we-code"

In his study, Guthrie explains that the home language of the learners was a language that indicates group membership and personal connections. For example, the teacher used Chinese in order to urge learners to behave. By so doing, the teacher was appealing to the learners as an insider. As a result of this action, learners and teachers built intimate interpersonal relationships among themselves in the classroom. In this respect, it may be claimed that, the use of the home language was a tool for creating linguistic solidarity (Sert, 2005) especially between individuals who share the same language identity. The language reflects their identity and functions as a bridge that built solidarity among them.

In her study, Setati (2005a) argued that while the learners' home languages can be a resource for teaching and learning mathematics, teachers used it mainly for solidarity purposes. The home language, in the lessons she observed and analyzed, was used as the language of solidarity. To show this solidarity, Setati explains that with English the instructions given by the teacher were said in a loud and emphatic voice while the home language instructions were phrased as requests, with no shouting and with the pronouns "we" and "us" to suggest that the teacher counted herself with the learners. Setati further argues that in these classrooms English was, therefore, used as the language of authority. It was used by the teachers to control the learners' behavior, and the learners would change their behaviors immediately. On the other hand, the home language was used as a language of solidarity where the teacher supported and advised the learners to show that the teacher was willing to help them.

Khisty (1993) also reports that Spanish in the mathematics classrooms was used as "markers of solidarity". The teachers would use Spanish to give encouragement or to motivate the class; it was also used when the teacher worked individually with a learner almost as a private but shared mode of expression. Similarly Flyman-Mattsson & Burenhult (1999) investigated the second language teachers of French in Sweden on the

features of code-switching. They found that the teacher would switch to the home language of the learners when signaling friendship and solidarity. This switching was directed to learners with a lower proficiency in the second language. The teacher also switched to the home language of the learners in order to fraternize with the learners to create a positive attitude towards the task under discussion. Solidarity was shown with the learners by expressing understanding of their problems in the home language. Thus the home language is used as a language of solidarity or as a "we-code".

Thus code-switching may be used in order to build intimate interpersonal relationships among learners and teachers in a multilingual classroom. Holmes (1992) in Australia, observed that the teacher and her learners code-switched from English to Aboriginal during their conversation that reflected their ethnic identity and functioned as a bridge that built solidarity among them. In this sense, one may speak of code-switching as creating a supportive language environment in the classroom. The use of the home language can be viewed from the perspective of providing a linguistic advantage rather than an obstruction to communication in a mathematics classroom.

Clarification

Clarification is a situation where a teacher seeks to explain the word that has more than one meaning in different contexts. Guthrie (1984) gives an example where the teacher used Chinese to explain the word "lost" as used in two different contexts. The first one is "what does 'I lost my pencil' mean" and "I was lost in the park". The explanations to these sentences were given in Chinese. Therefore, this teacher used the home language of the learners in order to clarify the meanings of words that have different meanings in different contexts. This implies that mathematics teachers may use code-switching in order to transfer the necessary knowledge to the learners for clarity.

Martin (2002) found that code-switching into Malay was used to unpack the meaning of the text. What occurred in what he observed was the default mode to talking around content area assists in the classroom. These findings support the ones from the study conducted by Lin (1996) in Hong Kong classrooms that relates how Cantonese was used to explain texts in English. Also Camilleri (1996) notes the way teachers and

learners in secondary schools in Malta switch between Maltese and English in interacting with English texts. Teachers switch between English and Malay to reformulate or restate an idea which is first expressed in the other language. In this case, the author argues that many switches do actually develop the discourse, introducing new content or providing exemplification or clarification.

Sert (2005) calls this functionality of code-switching in classroom settings as a repetitive function. The teacher uses code-switching in order to transfer the necessary knowledge to the learners clearly. Following instruction in the target language, the teacher code-switches to home language in order to clarify meaning. However, Sert reports that the tendency to repeat the instruction in the home language may lead to some undesired learner behavior. A learner who is sure that the instruction in the foreign language will be followed by a native language translation may lose interest in listening to the former instruction which will have negative academic consequences, as the learner has limited exposure to foreign language discourse.

Mathematics classroom studies show that there is a need to realize that there are some learners who need clarification of meaning even for common words that are being used in mathematics. For example, Kazima (2006), reports that learners gave different meanings to the word ‘impossible’ in a mathematics classroom. She conducted her study in Malawi where the LoLT was not the first language of the learners. The learners in her study were asked to come up with meanings for different mathematical words and ‘impossible’ was one of the words given to the learners. She explains that learners gave examples of impossible events such as “impossible to fight in school”, or “impossible my father will visit today” or “impossible to do mathematics work by myself” (p. 186). Kazima argues that, although the examples were not necessarily impossible events in mathematical terms, it was clear that the learners considered them as impossible events. This reflects the ordinary English meaning of the word ‘impossible’ rather than a mathematical meaning.

Clarification of mathematical concepts can also be done using different strategies in multilingual classrooms. For example, Moschkovich (1999) provides an analysis of the

strategies that teachers used in order to support the mathematical discussions in the class of young Spanish-speaking in the USA. The strategies included: modeling consistent norms for discussion; revoicing learner contributions; building on what learners said and probing what learners mean (p. 18). Revoicing and modeling of the learners words helps to clarify the meanings of the mathematical words and hence enhancing the understanding of the mathematical concepts. Moschkovich argues that subject-specific discussion as a focus of attention was not spontaneous for any mathematics learner. It was rather learnt in a context of participation with the teachers who translate, model, revoice and probe the contributions of the learners to school mathematical practice.

Khisty (1995), however, cautions that terms can be confusing in one language and not confusing in another language. Khisty argues that each language has its own way of expressing mathematics concepts. For learners whose LoLT is not their home language attention must be given to clarifying confusions that may be caused by mathematical concepts either in the home language or the LoLT. Teachers, therefore, need to be very cautious in their use of language.

Thus with reference to this discussion, one wonders whether mathematics teachers are aware that each language has its own way of expressing mathematics concepts as they get involved in this practice of code-switching? Are they aware of the complexities of teaching in a multilingual class of learners who are still learning the LoLT? It is in the interest of this study to find out whether and how mathematics teacher educators attend to these language complexities.

Checking for understanding

As mentioned earlier, one of the reasons for code-switching to the home language is to make the learners understand the teachers' utterances. In most cases, code-switching is used as a repetition of the previously uttered sentences. Guthrie (1984) explains that when the teacher in his class sensed that the learners did not understand what he/she was saying, she switched to Chinese or asked for an equivalent word in Chinese from the learners. Guthrie says that, by using the learners' first language, the teacher was able

to dig out confusions and misunderstandings. By asking the learners to give out a Chinese equivalent word, Guthrie explains that the teacher sensed quickly and efficiently how well the learners understood what was being taught. Flyman-Mattsson & Burenhult (1999) also report that teachers used the learners' home language to check whether the learners had understood what they were teaching. This also worked to the advantage of the teacher as he/she was able to pick up the misunderstanding quickly.

Studies that have investigated a learner's understanding of mathematics words have shown that some learners do not understand many of the words that are commonly used in mathematics classrooms (Williams, 1992). In particular, the words that have one meaning in mathematics and another in ordinary English (Pimm, 1987). For example, as said earlier in section 3.2, words like 'set', 'point', 'table', and 'altogether'. In the case where learners' home language is not the same as LoLT, learners may attempt to read, write and understand the mathematical sentences in the same way that they read, write and understand standard narrative text (Jarrett, 1999). Other learners may also give an English meaning instead of a mathematical meaning. The use of these words might bring confusion and misunderstanding among learners. The learners may try to translate word by word between mathematical concepts and in most cases in a linear translation.

By using the home language of the learners, the mathematics teacher would be able to pick the variety of meanings that learners attach to a single mathematical word. In so doing misunderstandings and confusions can be dealt with immediately before going further with the teaching. However, this may work in cases where the teachers themselves are fluent in the home language of the learners. If the teachers speak the home language of the learners, they may make a conscious effort to use the learner's home language as often as possible in their classrooms. While, if the teacher does not speak the home language of the learners, this practice may be difficult. As a result, confusions might arise because learners may have difficulties in trying to understand the mathematics being taught as the teacher would not have the necessary skills to rephrase the learners' meanings in their home languages.

Giving procedures and directions,

Guthrie (1984) reports that the teacher in his classroom occasionally gave procedures and directions in Chinese. For example, the teacher used Chinese to get the learners to use a key word in a complete sentence. Similarly, Flyman-Mattsson & Burenhult (1999) and Setati (2005b) report that teachers in their classrooms used the home language of the learners in giving procedures and directions. However, this is possible only if the teacher is able to speak the home language of the learners. The question that one wonders is, how does this work where a teacher is posted to an area where he/she does not know the home language of the learners?

The discussion above suggests that code-switching cannot be avoided in multilingual mathematics classrooms. The practice is significant, multifaceted and has its own challenges. Understanding how teachers cope with these strategies in multilingual classrooms requires much more than seeing how the teachers work with the learners in such classrooms. It also requires insight into the language practices that they are exposed to during their training in teacher training programmes. For example, how do mathematics teacher educators help student teachers to tackle other linguistic demands that they (student teachers) may meet in the process of teaching mathematics? Student teachers may be required to be exposed to the richer and more complex language practices that may help them when they begin the actual teaching. One may ask the question: Are the student teachers aware that each language has its own way of expressing mathematics concepts? Are they aware of the complexities of teaching in a multilingual class of learners who are still learning the LoLT? Are they being helped to understand how language use can be incorporated in mathematics teaching? Do they receive systematic training in the use of language in mathematics teaching? It is the hope of this research to find the practices that the student teachers are exposed to during teacher training.

3.3.2 Use of different discourse practices

The common discourse practice in multilingual classrooms is the use of the IRE (Pimm, 1987). Pimm (1987) explains that, in a mathematics classroom, the oral communication tends to be strictly controlled and one of the difficulties with the teaching and learning

of mathematics is the emphasis on a quiet, controlled, individual atmosphere as being appropriate. He further argues that the most familiar situation in a mathematics classroom is that of a teacher initiated question and the response is then evaluated. In this type of communication a teacher retains control of the conversation. Colleman (1996) reports that, in the classroom in Brunei where he conducted his study, it was observed that the class was the orchestration of choral responses (p. 17). Colleman referred to this as the 'completion chorus phenomenon'. Prophet & Rowell (1993, p. 204) in their study also reported that this phenomenon was common in a junior secondary school in Botswana. They referred to this strategy as 'the most commonly used question and answer technique'.

Investigating secondary school mathematics teaching strategies in Lesotho, Polaki (1996) reports how the teachers' strong desire to attain high pass rates in the public examinations led teachers to adopt the largely teacher-centered strategies such as teach, give an example and then learners do the exercise, question-and-answer, and exposition, consolidation and practice. Primary school teachers in Lesotho were also reported to have a preference for 'teach-example-exercise' as it was believed to be very effective in preparing learners for the examination (Polaki, 1996). In such situations mathematics teaching and learning are viewed as processes involving nothing more than the attainment of correct answers by using correct procedures. Writing about mathematics elementary classrooms in which the LoLT was the mother tongue, Burton (1992) echoes the same observation. She further observes that lessons are more often characterized by teacher presentations and independent silent work than by group discussion.

Chick (1996) conducted a micro-ethnographic study of a mathematics lesson in Kwa-Zulu Natal classrooms in apartheid RSA. He argues that the 'rhythmic manner in which ... participants synchronize the chorusing sequences ... serve social rather than academic functions' (Chick, 1996, p. 30). He outlines these functions on page 36, which include reducing the possibility of loss of face, giving classroom participants a sense of accomplishment, and allowing them to hide their poor command of English, to obscure their inadequate understanding of academic content, and to maintain the facade of

effective learning taking place. Johnson (1992, p. 169) reports that the last three functions are typical of the situation in Hong Kong multilingual classrooms. He reports that teachers resort to code-switching as 'the best solution to the problems'.

More relevant to my study is that this literature makes explicit claims as to what is considered as the most common teacher-pupil talk in a mathematics classroom. It shows the heavy reliance upon the IRE pattern of interaction. Classrooms need to be places where teachers assist learners to perform/act in many different ways using tools of different kinds, but particularly discourse. The traditional, easily recognized classroom discourse of the IRE variety tells a story in which children are constrained socially, cognitively and linguistically.

Krashen (1982) and Long (1983), report that, even though classroom discussions were being observed in their study, the effectiveness of those classroom discussions, was doubtful because it was the teacher who initiated what is to be discussed, decides who must provide a response, which the teacher either commends or condemns, and decides when to put an end to the discussion. According to Sinclair & Coulthard (1975) such classroom talk is characterized by a predictable sequence, which they call the initiate-response-feedback (IRF) sequence. As Le Roux (1996) noted, the IRF framework, which is very common in many less affluent African classrooms, places the learner in a responding role. The learners' opportunities for participating productively in the classroom in a multilingual classroom are very limited and constrained.

Apart from the IRE pattern in multilingual classrooms, it is also observed that, this IRE goes together with the procedural discourse. Procedural discourse is where the emphasis in teaching mathematics is aimed at establishing the steps that should be taken to solve a problem with little or no development of concepts. Khisty (1993) observed a pattern of discourse in a bilingual classroom, which she characterized as being procedural. This discourse introduces a learner to traditionally accepted procedures. Even though doing mathematics requires some knowledge of algorithms, it also requires a good deal of conceptual understanding in order to know why and how the steps should be

undertaken. When the emphasis is on following procedures, much of what the teachers say is in the form of directions that learners have to memorize.

Setati (1998) argues that switching between the learner's home language and English enhanced the quality of mathematical interactions in the classroom. She demonstrates that conceptual discourse (where the emphasis is on knowing why and how the steps should be undertaken) dominated in classrooms where the home language was being used. Thus the home language of the learners is being used to clarify the concepts and so enhance the conceptual understanding of the mathematics. Similarly, in Brunei, use of Malay allowed a greater freedom of expression and provided more meaningful opportunities for real communication which enhanced the conceptual understanding. This reflects that, when teachers in a mathematics classroom do not resort to the use of home languages, in most cases, their lessons are characterized by the IRE pattern of interaction accompanied by a procedural discourse. At this point, one wonders where these patterns of interactions come from. Can there be a link between what the teachers do in a mathematics classroom and what mathematics teacher educators do in a college mathematics classroom?

From the literature discussed in this section, in most multilingual classrooms, mathematics teaching is mostly done through the IRE interaction that focuses on procedural discourse. However, research on effective instruction for learners whose main language is not the LoLT emphasizes the importance of using a variety of methods (*discourses*) tailored to learners' needs (August & Pease-Alvarez, 1996). August and Pease-Alvarez explain that instructional methods (*discourses*) selected depend on the level (s) of English language proficiency and available resources, among other factors. Using multiple approaches (*discourses*), August & Pease-Alvarez (1996) and Reyhner & Davison (1993) argue that teachers can meet the needs of a wider variety of learners. Nystrand & Gamoran (1991, p. 257 - 258) argue that limiting classroom exchanges to the single traditional mode is at the heart of why life in schools is "emotionally flat", that is, classrooms may be orderly but they are frequently "life less".

Dufficy (2001) argues that different discourse practices encourage a child to practice constructing joint understandings of the world. Rather than the teacher's assuming control of knowledge and testing the child's "fit" to that conception, the options provide for the potential of knowledge sharing, and, crucially, life worlds are shared in classrooms, viewpoints are both expected and supported, class members summon the courage to pose questions, disagree and enter the wider social conversation on the issue, and patterns of discourse might come to be seen for the role they can play, including the IRE. One wonders about the extent to which mathematics teachers in multilingual classrooms can go with procedural discourse, the IRE or learner-centered discourse in order to help learners to learn and understand mathematics. I feel that, although teachers may provide instruction, the instruction should follow the learner's needs and interests rather than being prescribed in a predetermined manner.

Teaching and learning mathematics in multilingual classrooms is indeed complex. Teachers have their own strategies for dealing with the challenges that they meet as discussed above. A question that now needs to be answered is: What forms of classroom discourse practices in teacher training college mathematics classrooms would help the mathematics teachers develop strategies that would help them in dealing with these challenges? Beyond questions about the effectiveness of various classroom discourse practices are questions about who is able to engage in what discourse practices and language processes, when, and where. In other words, what constitutes college discourse practices for multilingual classrooms?

3.4 Conclusion

In the mathematics classrooms, the learners' home languages can vary a great deal. Mathematics teachers would want to use instructional strategies that respect and build on these differences while helping all learners learn important mathematical concepts and skills. This literature review highlights some instructional approaches that are used by teachers in a mathematics classroom that is multilingual, such as the use of everyday language and integrating the home language of the learners with the LoLT in trying to

accommodate all the learners in the classroom. However, these practices come with a lot of challenges and dilemmas.

In chapter 2, I indicated that teacher training programmes in most African countries do not focus on training the student teachers for multilingual classrooms. In fact, in most African countries where the use of home languages as LoLT are encouraged, teacher training programmes still train their student teachers as before the local languages were introduced. I argued that to improve learners' performance also entails training teachers for multilingual contexts. From the literature discussed in chapter 3, it shows that there is a gap between what the student teachers go through in a college mathematics classroom and what is experienced when they begin to teach. As indicated before, the question of what is being done in the teacher training programmes to help the mathematics teachers remains a mystery.

The next chapter develops a theoretical framework that will help in explaining the discourse practices of mathematics teacher educators in teacher training colleges in Malawi.

CHAPTER FOUR

THEORETICAL FRAMEWORK FOR INVESTIGATING DISCOURSE PRACTICES

4.1 Introduction

The purpose of this chapter is to develop a framework that will describe and explain how mathematics teacher educators construct a multilingual classroom and the discourse practices being produced in a college mathematics classroom. It conceptualizes the discourse practices used by the mathematics teacher educators as they prepare student teachers to teach mathematics. The framework developed here is shaped by Critical Discourse Analysis (CDA) drawn from Fairclough (1989, 2001, 2003). This provides the theoretical and conceptual tools to examine the discourse practices of the mathematics teacher educators and how they make available these discourse practices for the student teachers to draw on.

In broad terms, this chapter examines how to study the discourse practices of the mathematics teacher educators and how they support the student teachers develop discourse practices relevant for teaching and learning school mathematics in multilingual classrooms. This chapter is broken down into several sections. The first section discusses what it means for student teachers to develop discourse practices for mathematics teaching. The second section provides an introduction to CDA, followed by its origins, key terms and elements of Fairclough's CDA. Thereafter, I outline the strategies involved in doing CDA. The last section discusses why CDA is relevant to my study.

4.2 Discourse practices for mathematics teaching

In this chapter, I suggest that learning how to teach mathematics in multilingual classrooms can be understood as discourse practices where discourse practices here means "the whole process of social interaction of which text is just part of it (Fairclough, 1989, p. 24); and include language forms (written and spoken), patterns of

interactions among the participants, as well as values embedded in the use of language and power relations and attitudes to knowledge". Furthermore, discourse practices include language forms (written or spoken) which operate together with verbal and visual elements such as depiction and gesture in the context of "meaning- burdened designs" (Fairclough, Graham, Lemke & Wodak, 2004, p. 5). In other words, learning how to teach school mathematics in teacher training colleges includes the language that is in use in the college mathematics classroom together with accompanying verbal and visual elements in the context of teaching. It is a discourse practice with specific activities and discursive practices different from the learning of school mathematics. For example, student teachers, when learning how to teach, have to be able to deal with the problem of attending to different learners' solutions, whereas in learning the issue is just to get the solution, one does not have to know a variety of solutions. Thus, learning how to teach mathematics can be regarded as a distinct discourse practice.

Student teachers in a college mathematics classroom, therefore, learn and develop familiarity and confidence with the discourse practices for school mathematics teaching. Willet (1995) argues that learning a language is the process of becoming a member of a socio-cultural group. Willet further argues that, by engaging in the socio-cultural practices of the group, people gradually appropriate the language and culture needed to be considered an insider or part of the group. In Willet's (1995) words, we can say that learning how to teach mathematics is the process of becoming a member of a mathematics teaching community and requires student teachers to engage in its practices in order to acquire the discourse practices. The new discourse practices enables student teachers to become active members and be accepted by the wider community of mathematics teachers. However, in this case, student teachers can use the discourse practices after it has been made available to them through their mathematics teacher educators in the teacher training programmes. The question is how do mathematics teacher educators make available these discourse practices to the student teachers?

Through the interaction between the student teachers and the mathematics teacher educators in the mathematics teaching classroom, the student teachers are initiated into

the discourse practices. This means that, through the interaction, mathematics teacher educators in a mathematics classroom display the discourse practices for mathematics teaching to the student teachers as Mercer (1995) puts it:

> Teachers are expected to help their students develop ways of talking, writing and thinking which will enable them to travel on wider intellectual journeys, understand and being understood by other members of the wider communities of education (p. 83).

Although, Mercer was talking about school learners, his ideas apply just as well to the mathematics teacher educators. In Mercer's language, mathematics teacher educators are expected to help the student teachers develop ways of talking, writing and thinking which may enable them to teach in multilingual classrooms. Rogoff (1990, p. 195) explains that, while participating in social activity, individuals jointly build shared understandings of the activity. It can be argued therefore that it is in the process of finding the common ground and incorporating the language used, the skills, and the perspectives constituting the activity that the student teachers in mathematics classrooms acquire a range of discourse practices.

Therefore, I argue that mathematics teacher educators who have been in the practice for some time have acquired the discourse practices that are involved and need to be encouraged in order to develop discourse practices for school mathematics teaching. However, this may depend on their community, their access to resources and or the availability of the materials needed for activities related to their discourse practices for mathematics teaching development. Developing discourse practices for school mathematics teaching in a multilingual classroom is thus not simply an individual's activity; rather it is connected to the mathematics teacher educators and student teachers' participation and evolves in and through interaction in their classrooms.

It should be understood, however, that this is not a one-way process by which student teachers in a mathematics classroom will just appropriate knowledge and skills as displayed by their mathematics teacher educators. It occurs through the politics of social interaction (Bloome & Willet, 1991). Bakhtin (1982), Gee (1990), Goffman (1967), Gumperz (1982) and Willet (1995) argue that people not only build shared understandings in the process of interaction, they also evaluate, and contest those

understandings as they struggle to further individual agendas. Willet (1995) continues to argue that as people act and react to one another in a community, they also build social relations (for example hierarchical relations) and identities (for example, good student). According to Fairclough (1989), these structures both constrain and sustain relationships of power, solidarity and social order which are shaped by the broader political and historical contexts in which they are embedded. Through this process of interaction, these relations, identities, and ideologies are altered and reshaped (Rodby, 1992).

Bloome & Bailey (1992) argue that people build actions by acting and reacting to one another and holding one another accountable for acting within the evolving interpretive framework of the event. They establish participants' identities, roles and create norms, rules, and strategies for accomplishing events and criteria for evaluating them. Such an orientation has considerable implications for this study of the discourse practices of the mathematics teacher educators as they interact with the student teachers. In the process of acting and reacting to one another, the mathematics teacher educators and student teachers build their discourse practices. That is, what mathematics teacher educators say and do shapes both their discourse practices and the student teachers' discourse practices. Similarly, what student teachers do and say in the college mathematics classrooms also contributes to both the discourse practices of the mathematics teacher educators and of themselves.

In this research, I have used a CDA approach to examine the discourse practices of the mathematics teacher educators in teacher training colleges and how they enact these discourse practices for the student teachers to draw on. The next section discusses the theoretical underpinnings of Norman Fairclough's CDA. His systematic approach to and method in analysis are the reasons for its application in this study.

4.3 Critical Discourse Analysis (CDA), what it is and what it is for

CDA is generally classified as an approach which consists of different perspectives and different tools and methods for studying the relationship between the use of language and social context (Waller, 2006). Due to this diversity, studies in analyzing discourse

are different, derived from quite different theoretical backgrounds and oriented towards very different data and methodologies (Weiss & Wodak, 2002). For example, Waller (2006) argues that there are those who focus on a detailed analysis of texts – the linguistic features of text while, on the other hand, there are those who focus on the social aspects of text production, transformation, consumption and redistribution – that is focusing on discourse only. Within this diversity there also exist a normative approach and a critical approach (Waller, 2006). The normative approach focuses on just describing a situation, while the critical approach focuses on deconstructing hegemonic relations of power in and over discourse and how this undermines the social justice. The key figures in this area include Fairclough (1992a, 1992b, 1992c, 1993, 1995a, 1995b, 1996, 1998, 2001, 2003), van Dijk (1993, 1997, 1998a, 1998b, 1999, 2001) and Wodak (1996, 2000, 2001) among others. In this research, I draw exclusively on Fairclough's CDA methodology which attempts to bridge the texts and social aspect of text production by merging the normative and critical approach.

CDA is discussed by Fairclough (2001) as a visible and influential branch of discourse analysis, which is useful in analyzing the potential power and value of the words (either written or spoken) used by people in a community. It is an approach to the study of discourse which considers the use of language as a form of social practice (Fairclough, 1989, p. 20; Fairclough & Wodak, 1997, p. 258). It considers the context of language as crucial to discourse (Wodak, 2001) and it takes particular interest in the relation between language and power. In this theory, the analysis of discourse is not just transparent; it is instead a perceptive and committed approach that includes the web of examining the social processes implicated in the discourse (Aman & Mustafa, 2006, p. 5). This theory also proposes that a close and systematic analysis of discourse can reveal the nature of social practice in discourse. In other words the theory considers discourse as an aspect of social practice (Chouliaraki, 2000, p. 297).

Discourse, Fairclough (2003) further argues, is not only preoccupied with the analysis of texts (e.g. books, transcripts, letters, pictures and so on), but is more a matter of discriminating the systems and regulations which govern bodies of texts and the processes which texts themselves govern dialectically. Therefore, discourse as a "social

practice", is a relatively stabilized form of social activity (Fairclough, 1995a, 1995b, 1995c, 2003; Harvey, 1996).

Social practice refers to actual acts of human activity, utterances or writing. It also includes economical, political, cultural and ideological orientations (Fairclough, 1992, p. 66). In "mathematics teaching", social practices include different elements such as activities that involve reasoning, solving problems, explaining solutions and writing on the board. It also includes social relations, visual aids, teachers and learners, written and spoken word, and body language. CDA examines the social practices of individuals or institutions that involve concerns such as the use and abuse of power, hegemony, ideological operations, and social change as well as conflict, domination, race and leadership (Fairclough, 1992; Van Dijk, 1991; Wodak, 1996)

In short, when analyzing discourse, social factors that are embedded within the discourse as well as determine their own production need to be taken into account (Aman & Mustafa, 2006).

4.4 Origins and key elements of Fairclough's CDA

CDA came into being mainly through Fairclough (1989, 2003). It is grounded in theories of language that define language as a social phenomenon (Halliday, 1978; Kress, 1989). Fairclough (1989) assumes that people use language to accomplish a variety of social goals. He also assumes that any analysis of language must be linked to a social theory that encompasses both everyday social practices (for example, students and teachers discussing a book), and the social institutions in which they occur (such as in colleges) as well as the broader ideological context. Thus CDA is a sociolinguistic tool that facilitates a simultaneous focus on the linguistic features of a specific text, for example vocabulary, semantics, phonological features and on the social structures and practices underlying the text (Bloome & Talwalkar, 1997).

Fairclough builds on and uses existing social theories; however, he challenges social theory to include a perspective of discourse and language as it unfolds in actual texts and social interactions (Bloome & Talwalkar, 1997), which he calls text-oriented

discourse analysis (Fairclough, 1995). Fairclough argues that, if social theories are to be helpful in informing the everyday life of the community, then a thoughtful perspective of the nuts and bolts of language use must be part of the foundations of social theory because language use is part of the foundations of everyday life. This is so because according to Fairclough (2003) language provides a description of structures, events, social practices and relations between and among people and between and among institutions. However, for CDA "language is not powerful on its own – it gains power by the use powerful people make of it" (Weiss & Wodak, 2002, p. 14).

CDA as compared to other kinds of discourse analysis combines text-oriented discourse analysis with an in-depth understanding of recent sociological discussions of society, culture, and power (Gilbert, 1992). In addition, it has also provided a theory-method linkage that is absent in many sociological discussions of everyday life and language use and in many linguistic discussions of social dynamics. CDA has received much attention recently due to the reasons stated above.

CDA for Fairclough is concerned with the investigation of the relation between two assumptions about language use: that language is both socially shaped and is socially shaping (Fairclough, 1995, p. 131). Through the notion of different functions of language in texts, Fairclough identifies the theoretical assumption that texts and discourses are socially constitutive: "language use is always simultaneously constitutive of identities, social relations and systems of knowledge" (Fairclough, 1995a, p. 134). In other words, discourse simultaneously constructs (i) the social identity of a subject, namely social position, and character type (ii) the social relationship between people and (iii) knowledge systems and beliefs, in various degrees of importance depending on situations. Thus every text contributes to the constitution of these three aspects of society and culture. Fairclough (1995a) claims that these three aspects are always present simultaneously and one may take precedence over the others.

The three simultaneous constructs mentioned above are intricately linked to four language functions namely identity, relationship, ideational and textual functions (Aman & Mustafa, 2006). Identity functions are related to the ways in which social

identities are constructed by discourse. Relationship functions refer to the manner in which social relationships between participants is negotiated. Ideational functions concern the ways texts reflect not only the world but also its processes, entities and connections. Textual functions, on the other hand, refer to linguist information and social institutions that are outside of the text (Fairclough, 1992, p. 65).

Moreover, CDA aims at raising awareness of how people's subjectivities are shaped, influenced and constrained by institutional social structures, by demonstrating the extent to which texts, produced by an individual, construct or position the participants in the community (Fairclough, 1989). For Fairclough, these structures determine the role people act out in particular social situations, the identities and interpersonal relationships they perform, and the representation of the world that gets taken for granted as they interact with others. Thus, CDA gives tools to analyze how language symbolizes the community in particular interests and how texts position the members of the community and produce the relations of institutional power at work in classrooms. It assigns special significance to the structure of speech and texts and provides methods for specifying the linguistic features of different types of discourse units and the way they are connected together into larger units of meaning.

According to Fairclough & Wodak (1997), discourse is not merely a linguistic category or communicative medium; it is mediation between social structure and cultural practice. As a social process, discourse is linked intricately to the socio-cultural context from which it operates (Aman & Mustaffa, 2006). Thus it is neither produced, nor can it function in a vacuum; it is instead contextual discourse, one that is embedded within institutional systems of ideology. Consequently, we can say that mathematics teacher educators' discourse practices are tied to the context of teaching and can not be isolated from it. This suggests that the discourse practices of the mathematics teacher educators must not be understood as located in their minds but in their participation in interaction with each other and the student teachers in a mathematics classroom.

Furthermore, the way educators use texts in a multilingual mathematics classroom could also be a source of the patterns of particular social settings that they have constructed.

(The word ‘text’ here refers to the “social event” (Fairclough, 1993, p. 138) which includes language in use, whether written or spoken, that has consistency and at the same time implied meanings (Luke, 1992)). It may also be other forms of communication such as body language and visual images. These patterns according to Kress (1993) emanate from the sequence of coherent choices of words in the text, such as grammar. These choices together build up particular social worlds that represent the members in the community. Fairclough (1989) calls this the “representational function” of the text. Halliday (1978) argues that the purposes and actions of the members in a community mediate the form of language and grammatical choices to be used in the text. In other words, texts, written or spoken, build the position (Kress, 1989) of the speaker in the community. That is, the way one uses his/her text reflects the position s/he assumes in the community. Thus the way texts are produced and used in the mathematics classroom portrays the position of the mathematics teacher educators and how they position their student teachers. Thus, language in this sense is symbolic. Therefore, viewing language as symbolic, it can be argued that the way texts are produced and used by the teacher educators in a college mathematics classroom reveals and portrays the position of the mathematics teacher educators and the student teachers in their classrooms.

CDA is also concerned with analysis at both micro and macro levels, through the analysis at the intermediate level that of social practices and structures, in terms of genres, discourses and styles accessed, hence it includes both linguistic analysis and interdiscursive analysis (Fairclough, 2003, p. 3). It emphasizes ways to approach language (or more broadly, discourse), investigate relations of power and how they are constituted at the micro and macro levels.

4.5 Stages of analysis in CDA

The underlying principles in Fairclough’s CDA theory are its descriptive, interpretative and explanatory approaches towards discourse (Fairclough, 1992). Based upon these principles, Fairclough produces a three-dimensional approach to discourse analysis,

namely: textual analysis, discourse practice analysis and social process analysis. Fairclough (1995) describes this three-dimensional approach to discourse analysis as:

> A three-dimensional framework where the aim is to map three separate forms of analysis onto one another: analysis of (spoken and written) language texts, analysis of discourse practice (process of text production, distribution and consumption) and analysis of discursive events as instances of socio-cultural practice (p. 2)

He claims that his theoretical analysis includes three comprehensive ways to read the complex social conditions embedded in discourse, which primarily requires interdisciplinary, or at the very least, transdisciplinary skills (Fairclough, 1997).

Textual analysis

Textual analysis is a linguistic analysis of a text in which Fairclough (2001) explains that the main object of analysis is the text itself (both verbal and non verbal). It is a process whereby the structure and meanings of textual discourse are described. This analysis involves highlighting the formal features of the text such as the lexical items which includes vocabulary, pronouns, words that suggest a particular conception of how the community or classroom, in particular, operates and words implying metaphorical meanings, grammatical features, assumptions being made and absences. This stage requires analytical reading in order to highlight the formal features in the texts produced by the participants in the community.

In relation to the objectives and nature of the discourse analyzed in this study, in addition to highlighting the textual features, explanations are also focused on textual structures, that is a description of interaction control, namely who controls the interaction, turn-taking and structure of change in discourse. A reading of these aspects can provide insights into the discourse practices that are commonly used by the mathematics teacher educators in their classrooms and the knowledge system, beliefs, values or perceptions regarding social relationships and identities that are embedded in discourse (Fairclough, 1992, pp. 75 – 78, 234 – 237, 1995a, pp. 133 - 134).

Discourse practice analysis

Discourse practice analysis aims at interpreting the processes of discourse production at the micro level – that is, the interpretation of the relationship between text and interaction. At this stage, text is seen as the outcome of a course of action and as a resource in the process of interpretation (Fairclough, 2001). The interpretation may examine discourse production – whether it has been conventional or creative, producers of the discourse, the distribution and use of discourse as well as the presence of elements such as interdiscursivity of genre and intertextuality (Fairclough, 1992, p. 65, 134).

Genre for Fairclough is the use of language associated with a particular social activity (Fairclough, 1993, p. 138). For example, in a mathematics classroom, mathematics teaching as a genre has its own use of language, visual aids, bodily movements, sequencing of information, and its own style of teaching which might be different from other subjects. Thus different genres are different means of production of a specifically textual sort, different resources for structuring (Fairclough, 2000, p. 441). Furthermore, genre is also a set of relatively stable conventions, which are both creative and traditional. That means that genre is relatively stable and at the same time open to change.

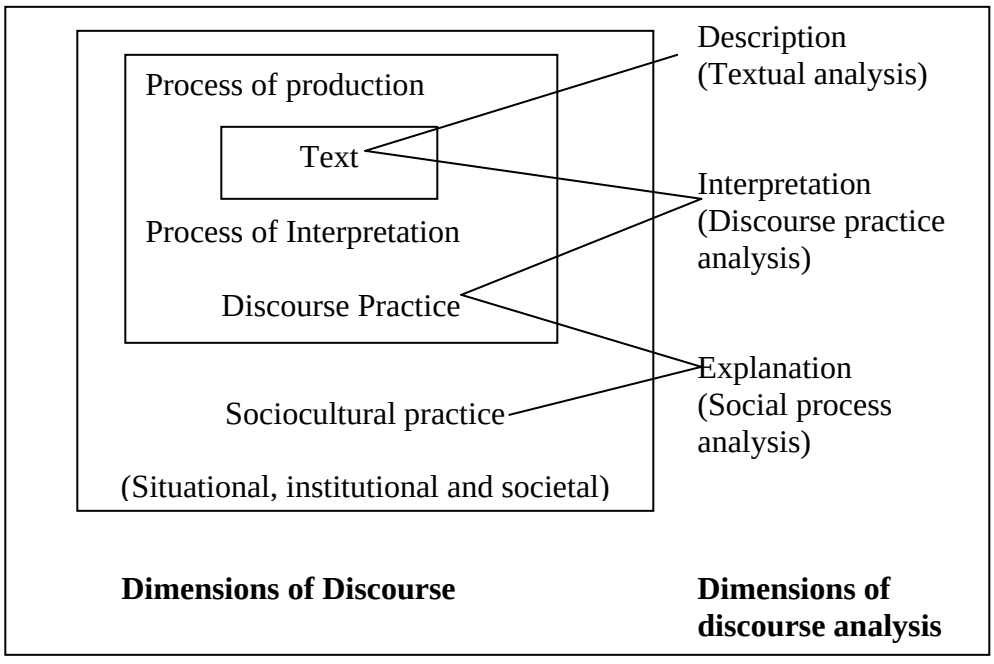
During this stage, features of the text are highlighted when seen cumulatively and in relation to each other and to the wider context, which can then be interpreted in terms of the particular epistemological and ideological beliefs of the participants. In this study, words and phrases of the text when seen cumulatively and in relation to each other will be highlighted. These words and phrases will act as clues that will characterise the discourse practices in college mathematics classrooms, that is, whether the discourse practices are conventional or creative. These clues may also suggest the ways in which the student teachers and their teacher educators relate to each other, the power relationship that exist between them, and some specific discourse practices.

Social process analysis

Social process analysis is concerned with revealing the social issues and practices that are embedded in discourse through its dialectic relationship with the nature of texts and discourse practices, as previously discussed. In other words, it is an analysis of the discursive processes and the social processes. It is concerned with the relationship between interaction and social context. The aim of this stage is to represent a discourse as a social practice (Fairclough, 2003). It extends the interpretation into an explanation of the findings found in the descriptive and interpretative stages. Such analysis aims at revealing the reasons why an addresser produces a particular discourse (Fairclough, 1992, pp. 226, 228). Therefore, in this study, this stage will represent the mathematics teacher educators' discourse as a practice that is displayed by the educators in a college mathematics classroom.

In figure 4.1, I present Fairclough's model of CDA.

Figure 4.1: Fairclough's CDA model of the relationship of dimensions of discourse analysis to dimensions of discourse. (Fairclough, 1995, p. 98)



Fairclough (1995), in this three dimension analysis of CDA, examines the production and utilization of text (and discourse practices) as a component of the system that ties together the discourse practices of the participants in the community and the existing power relations. The focus on processes of production and interpretation gives critical discourse analysis a merit for looking beyond individuals (Bloome & Talwalkar, 1997). This process is where the researcher analyses the factors, which may explain the social constructions of the responses given by the participants. For example, one may look at factors such as social relations, instruments or materials, objects, time and place, forms of consciousness, beliefs/values/desires and institutions/rituals (Fairclough, 1999, 2003). Thus for example, the production of a mathematics lesson in college mathematics classrooms involves not just the work of the mathematics teacher educators but also the work of the social institution including its discourse practices, material resources, and its political and economic location.

Analysis in CDA moves back and forth between text analysis (description), and analysis of power relations among the people participating in the community (interpretation). This back and forth analysis shows that the interpretation as well as the linguistic features of the conversation are bounded (although not strictly) by the discourse practices of the particular institution within which they take place. However, in my analysis, I do not focus only on the list of linguistic features outside of their context of use. As Bloome & Talwalkar (1997) argue, one cannot simply make a linguistic feature and code a transcript to illuminate power relations. The explication of power relations requires a dialectical praxis – a movement back and forth among social and linguistic theories and across methodological approaches to the analysis of texts and event. Thus in practice CDA is a form of a descriptive critique. Guided by this theory, I have developed the detailed process of data analysis that I have followed in this study which I present in chapter 6.

4.6 Exploring mathematics teacher educator's discourse practices through CDA

CDA provides tools to analyze how discourse symbolizes the mathematics classroom in college mathematics classrooms in particular interests and how the mathematics teacher educators are positioned in relation to their student teachers in the context of mathematics teaching. In this study, the theory of CDA will also be used to find out how the mathematics teacher educators in Malawi construct multilingual mathematics classrooms and how mathematics teacher educators use their spoken and written language. Furthermore, it will be used to uncover the discourse practices being used during their teaching in a college mathematics classroom and how they make available the discourse practices for the student teachers to draw on.

CDA addresses my interest in identifying the tacit as well as explicit features of mathematics teacher educators' talk (and accompanying non verbal communication) that impact upon the kinds of relationships and identities that exist in their college mathematics classrooms. These features would point to the discourse practices that the mathematics teacher educators display and make available for the student teachers. The central argument here is that the nature of the typical discourse practices of the college mathematics classroom in multilingual contexts may be a significant factor for producing the discourse practices for school mathematics teaching and making it available for the student teachers to draw on.

In a classroom situation, mathematics teacher educators and student teachers use language/texts (written or spoken) to make sense of their community and to construct social actions and relations required for teaching and learning mathematics. A great deal depends on both the mathematics teacher educators' and student teachers' capacities to construct, control and manipulate texts, if mathematics teacher educators and student teachers are to participate accordingly in their classrooms. According to Fairclough (2001), whenever people speak, write, listen, or read, they do so in ways which are considered as appropriate in a particular social setting. It can, therefore, be assumed that in a college mathematics classroom, for mathematics teacher educators to produce

texts accordingly (written or spoken language during teaching and interaction with the student teachers) and be able to control and manipulate texts, they need to know what to say and what to do, and at what time. Therefore, CDA in this case opens up additional ways for investigating what mathematics teacher educators in college mathematics classrooms know, in order to produce, interpret and evaluate the texts produced when teaching student teachers and the hidden motivations behind the language used. As for the student teachers, they need to know and understand the texts produced by their mathematics teacher educators and be able to manipulate, interpret and evaluate in the context, if they are to participate in their classes.

In the case of spoken texts like conversations in a college mathematics classroom, language is used to represent mathematics teacher educators' positions and ideas to establish and build up relations and identities. Spoken and written texts are objects in which cultural representations and social relations and identities are expressed through language and other signal structures (Luke, 1992). However, in a classroom situation, mathematics teacher educators' texts are not used for a fixed position or identity only. They are the actual media through which their socially constructed and contested identities are made and remade (Luke, 1996). Extending this into a mathematics classroom in college mathematics classrooms and the focus of this study, the interactions between mathematics teacher educators and student teachers should enable the student teachers to act as mathematics teachers. It can, therefore, be assumed that it is through the everyday texts produced by the mathematics teacher educators that student teachers learn how to recognize, represent and be a member of a community (i.e. a mathematics teacher in a multilingual classroom). What this means is that what mathematics teacher educators say, how they say it and how they interact with the student teachers together makeup available discourse practices for the student teachers to draw on. It is not only the school curriculum and policies that influence the student teachers' practices but also how the mathematics teacher educators use their language. Of course, how the student teachers use what they have learnt when they go for actual teaching in a primary mathematics multilingual classroom also depends on the context and local factors in the particular school.

Depending on how the discourse practices are made available, they may enhance or limit the development of the discourse practices necessary for school mathematics teaching in multilingual classrooms. The way mathematics teacher educators use their language may advantage some student teachers in a mathematics classroom to have access to the discourse practices for mathematics teaching while at the same time disadvantaging others. This suggests that the discourse practices of mathematics teacher educators can enable, obstruct or even deny the student teachers, and hence access to the discourse practices for school mathematics teaching. Through the practices of the mathematics teacher educators, the student teachers can exercise control and selection of the mathematics teaching practice. Thus learning how to teach mathematics is placed in cultural practice, in the community of a mathematics classroom. Therefore, the organization of activities can make the discourse practices for mathematics teaching and learning visible to student teachers in practice. It can further make visible the less explicit facets of multilingual mathematics classroom discourse practices. It will also provide a means for identifying thoughts that mathematics teacher educators promote and the interests they serve as they interact with the student teachers.

Thus, this research argues that mathematics teacher educators and student teachers interaction or talk in a mathematics classroom is a critical site at this stage, in the student teachers careers, in which different positions are created. It is argued that becoming a full participant as a mathematics teacher depends not only on the availability and use of mathematics or other textbooks, for example, but also on being exposed to and having insight into mathematics teaching practices. In line with this argument, the discourse practices of the mathematics teacher educators also contribute to the effective development of the student teachers in becoming full participants.

Considering the interaction and talk between the student teachers and the mathematics teacher educators in a mathematics classroom, the interaction between them involves the actual actions, problems, hopes and needs in regard to the primary mathematics teaching profession. The classroom talk as a discourse is one where the participants concerned are expected to share the characteristics of teaching. In other words, we can say that it is a power relationship which operates through the participant thoughts,

intentions, desires, and whatever contributions that may or may not be difficult to tell. In this sense, the interactions in a mathematics classroom serve to build the participants' identity as a kind of speaking subject, such as, for example, a facilitator or an expert. Thus interactions tell a story that reveals the participants' identities.

4.7 Summary and conclusion

This chapter identifies Critical Discourse Analysis as a theory that can be used to examine the discourse practices of the mathematics teacher educators in college mathematics classrooms in teacher training colleges. In this study, the CDA tools are used to identify the tacit as well as explicit features of mathematics teacher educators' talk that impact upon the kind of relationships and identities that may hinder or enhance the development of the discourse practices in student teachers. The chapter argues that the nature of the typical discourse practices of the college mathematics classrooms in multilingual contexts might be a significant factor for producing the discourse practices for mathematics teaching and making available discourse practices for the student teachers to draw on.

This research identifies mathematics teacher educators as a crucial source for the student teachers to develop discourse practices for teaching mathematics in multilingual classrooms. The language used is symbolic in the sense that the way one uses it reflects the position one holds in the classroom. Through the interaction between the mathematics teacher educators and the student teachers, identities are shared and passed on to the student teachers. Therefore, through the everyday use of texts, student teachers learn how to recognize, represent and be a mathematics teacher in a multilingual mathematics classroom. Thus, what mathematics teacher educators do, say, how they say it, together with the student teachers' interaction in the classroom make available discourse practices for the student teachers. Thus developing discourse practices for mathematics teaching in multilingual classrooms and how the mathematics teacher educators use them in a college mathematics classroom, are deeply linked to the on-going activities in the practice of teaching.

The next chapter presents the research design and the methodology for the study. I also present a discussion on how the colleges and the participants that participated in the study were selected and how interviews and observations were conducted. Furthermore, the discussion of the rigour in the research is also presented.

CHAPTER FIVE

RESEARCH DESIGN AND METHODOLOGY

5.1 Introduction

The purpose of this chapter is to outline the research design and the supporting methods of data collection, sampling techniques, and the research process of data collection employed in this study. I first discuss the research design. Then I discuss the methods used for data collection followed by the criteria for the sample selection as well as the samples of colleges and participants selected. This is followed by the discussion of the research process. I conclude with issues related to research ethics, and a brief account of validity and generalisability of the study.

5.2 Research Design

Exploring language (whether written or spoken) is fore grounded in the CDA process of analyzing discourse. According to Fairclough (2003) language is considered as one of the key raw materials out of which specific discourses are shaped (p. 2). There are several reasons for this. For example, Fairclough (2003) argues that "language is an irreducible part of social life, which is dialectically interconnected with other elements of social life, so that social analysis and research has to take into account language" (p. 2). Waller (2006) argues that, language provides a good description of structures, social practices, social elements, relations between and among people, between and among institutions […] (p. 14). In this connection, Waller (2006) further argues that, language is an excellent source of knowledge about the dynamics of a particular social phenomenon. Hall (2003) also supports this argument. For example, Hall (2003) explains that language "is a medium par excellence through which things are represented in thought and thus the medium in which ideology is transformed" (p. 36) for language itself is incorporative of the particular biases and ideological presuppositions of its users (Waller, 2006, p. 114). Furthermore, Poster (1989) argues that language "is not simply a vehicle of individual expression, a tool to facilitate

action, a means to determine truths and falsehood. Instead, it is an internally complex yet open world inextricably tied to social action" (p. 129). Thus in CDA exploring language helps to get a good description of social life of people in the community, how they relate to each other and what influences their actions.

As stated earlier, this research would like to explore and analyze discourse practices of mathematics teacher educators in their school settings, in particular during mathematics teaching. In a mathematics classroom, teachers determine the rules and goals of mathematics teaching and help to legitimize and stabilize forms of discourse in their classrooms. Thus the exploration of discourse practices naturally leads me towards an approach and research design in which mathematics teacher educators' language (written or spoken) and actions will be given prominence. Devos & Fouche (1998, p. 123) define a research design as a detailed plan that shows how a researcher intends to conduct a given research. It is important that such a design makes use of methods and techniques that suit the problem and these should be able to provide the most reliable and valid data (Hopkins, 1976, p. 237). In this thesis, I have used Fairclough's CDA methodology (as discussed in chapter 4) and a qualitative research design and framework to get thick descriptions of the discourse of the mathematics teacher educators.

Qualitative research design aims at understanding and interpreting how participants in a social setting construct the world around them (Glesne & Peshkin, 1992, in Leedy, 1997). Qualitative researchers want participants to have a more open-ended way of giving their views and demonstrating their views in which qualities, characteristics or properties (Henning, Van Rensburg & Smit, 2004) are examined and explained. In addition, qualitative research involves an investigation of the quality of relationships, activities, situations or materials (Maxwell, 1996).

Henning *et al.* (2004) argue that to understand and explain in logical arguments, the understanding should not be placed within boundaries of an instrument that are designed beforehand since it will limit the data to those boundaries and therefore the understanding will also be dependent on those boundaries. The approach therefore,

should allow mathematics teacher educators to have a more open-ended way of giving their views and demonstrating their views in their school settings. In addition, in understanding the discourse practices of mathematics teacher educators entails, in part, understanding the meaning that members of the institution attach to events, situations and actions in their daily lives in their institutions. Thus the qualitative approach is more compatible and provides an appropriate research framework for this study.

The activities that are employed in this research and in accordance with the CDA process and qualitative research design are dependent on specific data sources, texts, data collection methods and procedures that will focus on the language and actions of the mathematics teacher educators. In the next sections, I will address these specific data sources as they relate to this research project.

5.3 Data collection methods

The main source of data in CDA is the use of secondary texts. However, in addition to the use of secondary data in CDA, Chouliaraki & Fairclough (1999) suggest the use of other qualitative methods of data collection. The nature and focus of analysis of this study is on the language and the actions produced in a mathematics classroom. As a result, secondary data will not be extensively used. What will be considered is an evaluation of several texts relevant to the research project which is undertaken using a combination of qualitative data collection methods.

Cohen & Mannion (1994) caution that, it is not good to rely heavily on any particular research approach. Instead, Cohen & Mannion suggest the use of triangulation which involves combining different sources of information and different methods. They argue that this triangulation provides the richness and diversity of social setting. In this study therefore, I used a multi-method approach to data collection that enabled a deep probing of the language practices of the mathematics teacher educators of the chosen research sites. These methods include the following which will be discussed the next section:

(i) Pre-observation interviews.

(ii) Classroom observations.

(iii) Reflective interviews.

(v) Focus group discussions

5.3.1 Pre-observation interviews

Interviews (and observations) are the "most common and powerful ways in which we try to understand our fellow human being" (Denzin & Lincoln, 2005, p. 645). According to Chouliaraki & Fairclough (1999), the use of interviews (and direct observations) provides "an invariable tool for assessing the articulatory process in the practice and specific function of discourse in it" (p. 62).

The objectives of interviews (and observations) include collecting concrete insights, understandings, meanings, constructions and perspectives of the interviewee's own experiences or knowledge on various issues (Chouliaraki & Fairclough, 1999, p. 61; Denzin & Lincoln, 2005, p. 645).

In this study, pre-observation interviews were conducted with four mathematics teacher educators in the sample (see section 5.4). The interviews were semi-structured in the sense that they were in the form of standardized interview. Henning *et al.* (2004, p. 53) observe that the dominant perception of a standardized interview is that it yields objective and neutral information. It also gives the respondents the freedom to express their feelings and perceptions without restrictions. Furthermore, it enables the researcher to have the freedom that allows him or her to explore reasons and motives for any given response and to probe further (Maykut & Morehouse, 1994, p. 83) in directions specified in the interview guide. This is important because it enables the researcher to amass rich data from which the sought explanation is constructed.

Through the use of pre-observation interviews, I got an understanding of each mathematics teacher educator's descriptions about multilingual classrooms, and the influences operating on them. I also discovered ways in which mathematics teacher educators' constructions were influenced by the beliefs or views of the larger society and the way their use of discourse practices influence this process.

Thus these pre-observation interviews focused on gathering information in three major areas:

- Mathematics teacher educators' descriptions of the multilingual classroom. This was important in order to have an understanding of each of the mathematics teacher educator's descriptions of multilingual classrooms, and the influences operating on them, so that later on, I am able to determine if their descriptions have any effect on the way they prepare the student teachers for a multilingual classroom.

- Mathematics teacher educators' understanding of Language-in-Education Policy (LiEP) in Malawi. This was important so as to clarify whether they are aware of the existence of the new LiEP in Malawi and to check if their knowledge of the LiEP influences their discourse practices in their classrooms.

- Mathematics teacher educators' views about teaching and learning mathematics in multilingual classrooms. This was done so that I know how they talk about teaching in multilingual mathematics classrooms.

Therefore, the use of pre-observation interviews was instrumental in gathering rich information from the mathematics teacher educators about substantive meanings that they give to a multilingual classroom and what teaching mathematics in these environments entails. This information helped me to present their descriptions in their own voice (Fairclough, 1992).

Gallivan & Keil (2003) suggest that participants during an interview often withhold information especially if it is contentious information, because they perceive such views to be undiscussable or because prior history has shown them that such negative feedback will be ignored (p. 38). However, conducting the study in Malawi enabled me to understand the conversations and expressions easily. I was also mindful of my own discourses, expression and language during these interviews just as Alvesson & Deetz (2000) say:

> "…the intellectual rule […] of the critical researcher consists in creating the conditions that allow an open discourse between different social actors and not in establishing a superior insight or an authoritarian truth" (p. 1555)

5.3.2 Classroom observations

Classroom observations are important because the observer sees and gets first hand information of the focus of inquiry (Henning *et al.*, 2004). Erickson (1986) states that the "decisions the observer makes about the foci of attention in any one occasion of observation affects the completeness and analytical adequacy of observation made cumulatively across a set of trials" (p. 30). In this research, the focus of the classroom observations was on what the mathematics teacher educators said and did, enabling me to make claims about mathematics teacher educators' discourse practices in a college mathematics classroom.

Up to five hours of mathematics lesson observation of five consecutive lessons in one of each mathematics teacher educator's classes were conducted. Through the use of these observations I was able to observe the type of interaction that exists between the mathematics teacher educators and their student teachers and how they relate to each other.

These classroom observations were video recorded and a professional photographer was hired to do the video recording. Permission was sought first in writing (see section 5.6) from the Mathematics teacher educators under study and their student teachers about my presence and the photographer and the video camera before the recording was done. The photographer was instructed to focus on the mathematics teacher educators and his/her interactions with the student teachers. This was helpful as the video pictures came out nicely and the mathematics teacher educators' voices were very clear. However, though helpful, it is not without problems. Though instructed to focus on the mathematics teacher educators, it would still be different if I did it myself because I would choose what, where and when to focus. Nonetheless, most of his focus was on what I had instructed him to do.

According to the literature, all observation disturbs what is being observed (Henning *et al.*, 2004) and the presence of the researcher and the photographer may change the behavior of the people in the study. However, the first three classroom observations served the purpose of the mathematices teacher educators and the student teachers becoming familiar with our presence and that of the photographer and the video camera. These classrooms also helped the mathematics teacher educators to become comfortable with all those in the classroom and helped to establish a sense of trust and rapport among the student teachers, the mathematics teacher educators, researcher and photographer. Thus the first three classroom observations helped to reduce the effect that we might have caused in this study.

5.3.3 Reflective interviews

The reflective interviews were conducted with each mathematics teacher educator separately after all the lesson observations. These interviews depended on the lessons observed and were facilitated by showing the mathematics teacher educators selected video recordings of their lessons. These interviews were important because they were a follow up to some issues that were seen during observation, for example, questions to explain why they structured their lessons the way they did. This gave information on their views on what they regarded as important in preparing the student teachers. In addition, it helped to crosscheck what mathematics teacher educators perceived against what they did during a lesson. Reflective interviews with each mathematics teacher educator on the classes observed were tape recorded.

5.3.4 Focus group discussions

Focus group discussions can present unexpected interactions, insights, ideas and information about a phenomenon. Maykut & Morehouse (1994) argue that focus group discussions bring several different perspectives into contact to understand what people experience and perceive about the focus of inquiry, through a process that is open and emergent. In this study, the focus group discussions were used to explore the mathematics teacher educators' perceptions about the discourse practices that are used in their college mathematics classrooms. The focus group discussions were also used to

get the perceptions and understanding of the mathematics teacher educators' experiences of their discourse practices during mathematics teaching and learning.

These focus group discussions were conducted with all the mathematics teacher educators involved per college (two in all) on issues of the data. These discussions were also tape recorded.

5.4 Research sampling and procedures

To undertake the CDA process also required the selection of mathematics teacher educators and teacher training colleges relevant to the aims of this study. In this section, I will present the teacher training colleges and the mathematics teacher educators selected for this research. These were identified purposefully. Sampling according to Merriam (1998) is the selection of the research site, time, people and events in the field (p. 60). The sample in the research can have a significant impact on the trustworthiness of the findings and so the process of deciding this sample is one of the crucial stages of the research process.

Purposive sampling according to Patton (1990) provides a researcher with the capacity to select participants relevant to the purpose of the research. These selected participants are referred to as "information rich cases" that is "those from which one can learn a great deal about issues of central importance to the purpose of the research" (Patton, 1990, p. 169). These guidelines were instrumental in the selection of the participants in this research.

5.4.1 Teacher Training Colleges (TTCs) in Malawi

In Malawi, there are six Teacher Training Colleges located in all the three regions. Two of them are owned by churches while four are government owned but all of them are responsible to the Ministry of Education which provides the salaries of the staff and stipends for trainees.

Initially, the intention in this study was to have one TTC from the southern region and one from the northern region of Malawi and two mathematics teacher educators from

each college. These colleges were chosen because of the distinct differences in their local languages as described in chapter 1, which could have provided similarities and differences in the discourse practices produced by the mathematics teacher educators, whether or not they could be the same. Doing this research meant that I had to be conversant with the local language of the participants and that they had to be able to understand me too. However, when I went for data collection, I discovered that there were difficulties for me to understand the language in the northern region and for them to understand my language as well. That meant that code-switching would not have been an option, and meant that I should have had an interpreter, which would have been a major limitation to the research since it concerned language issues as well. So I decided to undertake the research in the regions where we could understand each other. As a result, the TTC from the northern region was dropped and the one from the central region was chosen instead. In the next section, I present a brief description of the two colleges chosen; the names that have been used are not real ones.

Chayamba Teacher Training College (CTTC)

This is one of the colleges in the central region of Malawi. It is situated in a rural community, a considerable distance from the town of the district. This institution is owned and run by the government. It is a mixed college with a capacity of 700 student teachers. These student teachers are divided into 16 classes which are shared among the four mathematics teacher educators, which meant that each mathematics teacher educator had at least four mathematics classes with a minimum of four hours per week per class. Each class on average had 45 student teachers. Three of the mathematics teacher educators were Malawians and one white, who was an expatriate. The two participating mathematics teacher educators selected from this college came from the central region of Malawi and spoke the same local language (more in section 5.4.2).

In this college, two languages (Chitumbuka and Chichewa) were dominant in and around the college. There were also other minor languages such as Tonga and Yao. However, the minor languages were not heard either in class or outside the classes.

The college is well resourced. It has administration offices separated from the class rooms. The staff room and the library were located in the administration block. Even though offices for teacher educators were inadequate, it had enough classrooms, desks and chairs for the student teachers.

This college has a full primary demonstration school within its campus where the student teachers do their micro teaching for the last two terms of the academic year before going for the actual teaching practice. The learners at the demonstration school are the ones from the surrounding villages. Teachers who come to teach at the demonstration school are all qualified and experienced and they attend interviews before they come to teach at the school. They do this because these primary teachers help the mathematics teacher educators in supervision when it is time for micro teaching. The grades obtained for the micro teaching are considered as part of the continuous assessment.

Kachere Teacher Training College (KTTC)

This college is located within a commercial city in the southern region of Malawi. It is a mixed college with a capacity of about 600 student teachers. Like Chayamba TTC, it is owned and run by the Malawi Government. The 600 student teachers were divided into 11 classes which were to be shared among the three mathematics teacher educators, who were all Malawians but with different home languages. On average, each class had 55 student teachers. Each mathematics teacher educator had at least four mathematics classes and a minimum of four hours per week per mathematics class. The two participating mathematics teacher educators selected from this college were from the northern region of Malawi and had the same home language (Chitumbuka) (more in section 5.4.2).

Unlike Chayamba TTC, at this college, four major languages (Chichewa, Lomwe, Yao and Sena) were dominant, although only one language (Chichewa) was heard in and outside the classroom.

The college is old and did not have enough facilities such as student teachers' desks and chairs. The administration offices were separated from the classrooms and the staff room and the library were located in the administration block.

This college also has a full primary demonstration school within its campus, where the student teachers do their micro teaching two hours per day per week during the second and third term of their academic year. The teachers who go to teach at this school are fully scrutinized because they help the teacher educators in supervising the student teachers when they go for micro teaching.

5.4.2 Selection of the participants

According to the principles of Critical Discourse Analysis, the researcher must be self-conscious, and write his or herself as a distinctive and recognizable voice into the study alongside his or her informant (Waller, 2006). I, therefore, drew on my experiences working as a mathematics teacher educator. I believe that such exposure positions me to be able to explain the language practices of the mathematics teacher educators well. Such an approach helps me to make sense of how the participants interpret and socially construct reality and the possible influences which may have contributed to such constructions.

The sample was based on four mathematics teacher educators from the two TTCs, two mathematics teacher educators from each college. From a CDA perspective, the sample size is enough to provide insights into the specific cases from which one can construct an understanding (rather than a statistical explanation) of broad phenomena. This implies that the sample size used in this study, though apparently small, was sufficient to generate substantial quality information needed to answer the research questions for this study.

These participants were chosen according to the following criteria:

1. Each mathematics teacher educator had to have a tertiary mathematics qualification to ensure that he or she has at least a high level qualification. This

was done to rule out the possibility that their practices might be due to not being well-qualified for the profession.

2. Each mathematics teacher educator had to have at least three years of teaching experience at college level in order to rule out the possibility that their discourse practices might be due to lack of teaching experience.

3. They were also selected on the basis of their willingness to participate in the study.

On the issue of participants, as I have already pointed out, it was supposed to be two mathematics teacher educators from each college. However, one of the two mathematics teacher educators selected from KTTC, got sick after the lesson observations. She was unable to speak and did not report for work for two weeks. This meant that we could not have reflective interviews with her and so there was no chance for her to comment about her actions. Her absence, however, meant that I had to conduct the focus group discussions with one participant which was not possible because that would be the same as having reflective interviews with him which we had already done by that time. Therefore, I included one of the mathematics teacher educators who was available at that time. This was a difficult decision to make but I wanted to find out different perspectives and to understand what mathematics teacher educators perceive about the discourse practices that they do in their lessons.

At the other college (CTTC), one of the two mathematics teacher educators who was involved in this study was later chosen by the college administration to go for a curriculum review workshop as he was the one involved in those issues at the college. So, he dropped out after the pre-observation interviews and after observing his two lessons. This meant that I could continue with one participant or choose another one. Since I wanted to have a balanced view and a fair representation of what the mathematics teacher educators do, I started the whole process again with another mathematics teacher educator. However, this change did not have a significant effect on the data that was collected since this mathematics teacher educator satisfied all the requirements that I used in choosing the participants. The effect was that it took me

more days to finish data collection than planned which had a bearing on the cost as well. In the next section, I present the brief description of all the mathematics teacher educators who were involved. The names that have been used are not real ones.

Background of the mathematics teacher educators

Mrs Joshua

Mrs Joshua comes from the northern region of Malawi where her home language is Chitumbuka. She did her tertiary education at the University of Malawi – Chancellor College in Zomba district where she graduated with a Bachelors degree in Education majoring in mathematics in the year 2002. She worked as a secondary school mathematics and geography teacher at one of the secondary schools in Malawi from 2002 to 2004. Then she joined Kachere TTC where she had been teaching mathematics and life skills for three years.

While working as a mathematics teacher educator at KTTC, Mrs Joshua attended two professional developmental courses. The first one was in 2005 at the same college. The focus of the course was on the implementation of the Initial Primary Teacher Education (IPTE) programme which had just been introduced. The training was conducted by the Ministry of Education through the Malawi Institute of Education. After that, she attended another course on Primary Curriculum Assessment Reform (PCAR) in 2006 which was also conducted by the Malawi Institute of Education. Besides being a mathematics teacher educator, she was the Deputy Head of the social and environmental science department and the initiator of the mathematics club for female student teachers. Mrs Joshua was involved in Pre-observation interviews and classroom observations only because of the reasons discussed earlier.

Her mathematics class involved in the research had 47 student teachers of whom nine were females and thirty eight were males. The age range of the student teachers was 20 to 35. In her class, there were three major languages: Sena, Lomwe and Chichewa, and two other minor languages. However, everybody could speak and understand Chichewa.

Mr Lukhere

Mr Lukhere, like Mrs Joshua, comes from the Northern region of Malawi and his home language is Chitumbuka. He did his Bachelors degree with the University of Malawi – Chancellor College where he graduated in 2001 with a Bachelor's degree in Education, majoring in geography, and with mathematics as a minor subject. In the same year, Mr Lukhere started teaching at one of the urban secondary schools in the capital city of Malawi. He taught for four years and then joined the KTTC in 2005 January where he was teaching mathematics and life skills.

Mr Lukhere attended a number of workshops on the campus focusing on different areas which were mostly conducted by the donors through the Ministry of Education. In 2004, he attended an in-service training course which was conducted by the Malawi Institute of Education focusing on the orientation of the new primary school curriculum (PCAR). This was initiated by the change of curriculum at primary school so it meant change as well at the teacher training college.

Apart from teaching at the college, he also held other responsibilities at the college. He was the vice chairman of the assessment committee where he was involved in the planning and administration of end of term examinations, and processing grades for various subjects at the college. In addition, he was also a member of a computer committee where he taught the student teachers basic computer programmes for literacy.

His mathematics class in this study had 48 student teachers of whom 14 were females and 34 males. The age range of the student teachers was 20 to 35. The majority home languages included Sena, Lomwe, Chichewa and Yao. Chitumbuka was a minority group.

Mr Salama

Mr Salama came from the southern region of Malawi where his home language was Lomwe. He held a senior primary (T2) teachers' certificate and a Diploma in Education. He obtained the T2 certificate in 1981, from Lilongwe TTC in the central region of

Malawi. After obtaining this certificate, he taught as a T2 primary school teacher from 1981 until 1989. He then went to the University of Malawi – Chancellor College to upgrade his qualifications; he obtained a Diploma in Education in 1989 with a major in Mathematics. Then, he was promoted to teach as a secondary school mathematics teacher. He taught at the secondary school for a year and then joined the teacher training college where he has been teaching mathematics from 1990.

Mr Salama has attended a number of workshops conducted by different departments in the Ministry of Education and other agencies such as Gesellschaft für Technische Zusammenarbeit (GTZ) - Malawi. From 2001 to 2003, he attended a professional development course which was conducted by the British Council in Malawi. The focus of the course was on primary community teacher training of trainers. Apart from that, he also attended an in-service training course at the same college, which was conducted by GTZ, focusing on learner-centered education methods. Besides being a mathematics teacher educator, he was the head of the science and mathematics department, and he was also a member of the assessment committee of the college. In this study, Mr Salama was involved in pre-observation interviews and focus group discussions only.

His class had a total number of 50 student teachers of whom 34 were males and 16 were females. Their ages ranged from 18 to 30. The student teachers' main languages in the class included Lomwe, Yao, Sena and Chichewa. He shared the home language with one major group in his class.

Mr Kandiya

Mr Kandiya comes from the southern region of Malawi. His home language is Lomwe. He holds a Bachelors degree of Education, majoring in mathematics obtained from the University of Malawi, in 1995. Immediately after college, Mr Kandiya started working as a mathematics and physical science teacher at one of the secondary schools in Malawi until 2003. In 2003, he joined the TTC where he was teaching Mathematics.

Apart from being a mathematics teacher educator, he was appointed the head of the mathematics and science department and served for two years at the TTC. While at secondary school, he was the acting head and served as a boarding master.

His mathematics class that participated in the research had a total number of 45 student teachers where 19 were females and 26 were males. Their ages ranged from 24 to 35. The student teachers' main languages included Chichewa and Chitumbuka while the speakers of Yao and Lomwe were a minority. He did not share his home language with the majority of the student teachers in the class.

Mr Otani

Mr Otani comes from the central region of Malawi, where his home language is Chichewa. He had eleven years experience of teaching. He started teaching at primary school in 1993 where he taught for two years. By then, he had a T2 certificate in education obtained from one of the TTCs in Malawi. In 1996, he was transferred to teach at one of the secondary schools in Malawi where he taught from 1996 to 2004 even though he did not have the necessary qualifications, for example a Bachelors degree or Diploma in Education[2]. While teaching at secondary school, he obtained a certificate in special education from Montfort College of Education. He then joined the TTCs in 2005 where he was teaching mathematics. Mr Otani did not have any further responsibilities at the College.

His mathematics class that participated in the research had 50 student teachers of whom 16 were females and 34 were males. Their age ranges varied from 19 to 35. The student teachers' main languages included Chichewa, English, and Chitumbuka. There were also speakers of Tonga and Yao, but in a minority. He shared his home language with most of the student teachers in his class.

[2] In Malawi, the normal education level for secondary school teachers is either an undergraduate diploma or a bachelors degree in ones area of specialisation.

It is worth pointing out here that Mr Otani did not meet one of the criteria that I had put in place as he did not have a Bachelors degree. However, as I explained ealier, I had to include him as he was the only mathematics teacher educator left on campus after one of the participants withdrew. I feel that his experience in the teaching profession to some extent overrides the fact that he had no Bachelors degree.

Mr Chipasula

Mr Chipasula is a mathematics teacher educator who comes from the central region of Malawi where his home language is Chichewa. He held a Bachelors degree in Education, majoring in mathematics obtained from the University of Malawi – Chancellor College in 1995. After his graduation, he taught as a secondary school mathematics and physical science teacher in Malawi for five years. In the year 2000, he joined the TTC where he has been teaching for over 6 years. His teaching subject has always been Mathematics. Since he joined the TTC, he has never attended any professional developmental course, apart from workshops.

Besides being a mathematics teacher educator, he was deputy chairman of the assessment committee at the College where he was responsible for the planning and administration of examinations and the assessment of the grades at college level. He was also the head of the mathematics and science department.

His class had a total number of 48 student teachers where 10 were females and 38 were males. The ages ranged from 20 to 35. The student teachers' main languages included Chichewa and Chitumbuka, and he shared his home language with most of the student teachers in his class.

Table 5.1 shows the profiles of the mathematics teacher educators and their classes in summary.

Table 5.1: Profile of mathematics teacher educators and a summary of their classes in summary

Name	Highest Academic Qualifications	Teaching experience at TTC	Teaching Subjects at the TTC	Age	Number of student teachers	Female student teachers	Male student teachers
Mrs Joshua	BEd (Mathematics)	3 years	- Mathematics - Life Skills	28	47	9	38
Mr Lukhere	BEd (Mathematics)	3 years	- Mathematics - Life Skills	29	48	14	34
Mr Salama	Diploma in Education (Mathematics)	11 years	- Mathematics - Life Skills	48	50	16	34
Mr Kandiya	BEd (Mathematics)	4 years	- Mathematics	39	45	19	26
Mr Otani	- T2 certificate in Education -Certificate in Special education	3 years	- Mathematics	41	50	16	34
Mr Chipasula	BEd (Mathematics)	6 years	Mathematics	38	48	10	38

5.5 Research process

According to Erickson (1986) and Rose (1982), in reporting field work, one is to describe the purposes of the research, and how it developed over time, to include details of field work, data collection and methods for keeping field notes, but also an account of the process of data analysis. In this section, I outline the research process as conducted in this study.

The whole process of data collection was conducted for a period of two months (one month in each college) during the second term of the residential course. It was an intense period of data collection. This field work assisted me in extrapolating from various texts the "knowledge about moments of a social practice: (…) its social relationships and processes as well as values and desires of the participants" (Chouliaraki & Fairclough, 1999, p. 62).

My visit to the first college (CTTC) provided me with an insight into the reality of mathematics classrooms at TTCs and the concrete insights into how the student teachers are trained to teach mathematics in primary schools. Therefore, this helped me to be more focused in my questions when I went to KTTC. It also convinced me of the importance of discussions as a useful tool through which the meanings underpinning the interactions and actions recorded from lesson observations could be recorded by the mathematics teacher educators themselves. As agreed, the classes were to run normally and I had no specific topic to observe. All I wanted was to observe how they prepare the student teachers for primary mathematics teaching.

The data collection was in four stages: the pre-observation interviews; the classroom observations; reflective interviews; and lastly the focus group discussions. I shall now present the research process as conducted at the research sites. Before I do that, I discuss briefly the pilot stage that I conducted before the actual data collection.

Pilot

Before conducting the pre-observation interviews, I drafted the interview guide that helped me on the sequencing of the questions during the interviews, that is the order in which I would ask the questions. The interview questions were then piloted on a different mathematics teacher educator who was not involved in this research. The aim of this pilot was to determine the appropriateness of the interview questions as well as to refine the questions to be answered. It also sought to assess the structure and clarity of the interview questions as well as other issues such as layout and time. This led to some amendments in the interview questions.

Conducting the pre-observation interviews

The process of conducting the pre-observation interviews included two basic steps: first, I had an initial meeting with the principal of the college and then with the mathematics teacher educators at their institutions. The aim was to introduce myself to the participants and brief them on the nature of the study. This was done to establish convenient dates and time for the interviews and also personal relationships with the participants.

Secondly, I conducted the pre-observation interviews with the mathematics teacher educators in their colleges some hours before lesson observations. Each mathematics teacher educator was interviewed separately. The interview was conducted within one and a half hours with each mathematics teacher educator. The interview started at around 7:30 am in both colleges as the mathematics teacher educators were free during this and the followed period.

As explained in section 5.3.1, all the questions posed were semi-structured, with possibilities for further probing where necessary. All the mathematics teacher educators were asked the same set of key questions though sometimes in a different order according to how they answered a particular question. The flow of what information each mathematics teacher educator gave shaped the interview. Therefore, this pre-observation interview was a “talk to some purpose” (Hitchcock & Hughes, 1995, p. 79).

During these interviews, the mathematics teacher educators were allowed to use local languages, which both of us could understand, and English. This chance was given to allow them to express their views fully without language limitations. However, most of the interviews were done in English with very minimal use of the local language.

These pre-observation interviews were conducted in the months of January and February 2007 as shown in table 5.2.

Table 5.2: Dates of Pre-observation interviews

Name of the mathematics teacher educator	**College**	**Date of the interview**
Mrs Joshua	KTTC	08/01/2007
Mr Lukhere	KTTC	9/01/2007
Mr Salama	KTTC	22/01/2007
Mr Otani	CTTC	5/02/2007
Mr Kandiya	CTTC	5/02/2007
Mr Chipasula	CTTC	12/02/2007

The interviews at KTTC were conducted in a staff common room, which is used by all college teacher educators. During each interview, there were a number of interruptions as other teacher educators entered into the room. There was evidence reflecting the mathematics teacher educators' discomfort with being in their offices because of how it looked and because they were sharing and did not want us to disturb their colleagues.

In contrast, in the other college (CTTC), the interviews were conducted in what was supposed to be the deputy principal's office where the tables and chairs were arranged as in a conference room. This was so because all mathematics and some science teacher educators were sharing one big office. In the deputy's office, it was quiet with no disturbances by other college teacher educators or student teachers. All in all, these colleges were calm, orderly, and functioning.

In terms of order, the principal at KTTC never minded to introduce us (me and the photographer) to the mathematics teacher educators to be involved in the research. She

communicated with the mathematics teacher educators and let us meet the mathematics teacher educators and introduced us to them. In the mathematics classes, we were introduced to the student teachers as visitors. This kind of introduction made us to be very free with the mathematics teacher educators, because there was no protocol to be observed. We could go to the offices of the mathematics teacher educators without a feeling of breaking the protocol and so we were like co-workers. As a result of this, the process of data collection went on smoothly without going through hierarchical stages. In the other college, (CTTC) it was orderly, and all protocol had to be observed. We were first introduced to the head of the mathematics and science department, by the principal himself and later to the mathematics teacher educators by the head of the science and mathematics department. With this protocol at CTTC, we were careful not to break the protocol and so we had to ask before we could do anything. And this restricted our movements in the college and we felt that we were visitors on the campus. However, in the classes it was a bit different, in the sense that we were introduced as colleagues in the field of teaching by the mathematics teacher educators. This made a big difference as we were free inside their classrooms.

Apart from discovering things, I found that, in asking many of the questions, I encouraged some of the participants to reflect critically on their own discourse practices as they prepare the student teachers in their mathematics classrooms.

After the pre-observation interviews, mathematics lessons were observed where I was the key instrument as a researcher and interpreter of the data collected.

Conducting the classroom observations

Each of the four mathematics teacher educators was video recorded for five consecutive lessons of one hour each. There were no double lessons. The observations took place in January and February 2007. The photographer was instructed to focus on the mathematics teacher educator and his/her interactions with the student teachers. The aim was to capture the mathematics teacher educators' actions. However, in some cases the approach by the mathematics teacher educators seemed to be more learner-centered. So, besides focusing on the mathematics teacher educator practices in the classroom,

sometimes the photographer focused on what the student teachers were doing at a particular time.

It was agreed that the lesson to be video-taped should be part of the normal programme of teaching. As an observer, I did not participate in any classroom activities; each lesson was filmed by a professional photographer. We did not make any arrangements about the topics and areas being taught; however, according to their practice, all the mathematics teacher educators in all the TTCs were teaching almost the same topic, at the same time, and all the mathematics teacher educators were teaching the same level. Mrs Joshua and Mr Lukhere were video recorded teaching fractions, while Mr Otani and Mr Chipasula were video recorded teaching decimals. Besides observing the mathematics teacher educators' actions and practices in their classrooms, the student teachers' involvement was also observed.

Conducting reflective interviews

The reflective interviews were conducted with each mathematics teacher educator separately after all the classroom observations. Each interview took about one hour to one and a half hours. At KTTC, I did the reflective interviews with one mathematics teacher educator (Mr Lukhere) after three days of observing his lessons. The interviews were conducted in the student teachers' computer room, because, during that time, there was no class. There were no disturbances, it was quiet and calm. The second mathematics teacher educator, (Mrs Joshua) was sick for more than two weeks, and had to go to the Malawi Institute of Education for curriculum review soon after her recovery where she stayed for another two weeks, so I was unable to do the reflective interview with her.

At CTTC, I did the reflective interviews with the two mathematics teacher educators separately. One of them refused to go to the same place where we did the pre-observation interviews because he said it was far away and instead we did the reflective interviews in their office. During this interview, there were so many interruptions that we both would forget what we were discussing. There were a number of student teachers coming in and he preferred to attend to the student teachers first and then we

continued with the interview. This went on for the whole period of the interview. The other mathematics teacher educator suggested that we go to the deputy principal's office where we did the interviews. In this office, there were no disturbances.

Each of the three reflective interviews was tape recorded and took place as presented in table 5.3.

Table 5.3: Dates of Reflective interviews

NAME	DAY	DATE
Mr Lukhere	Friday	19/01/2007
Mr Otani	Monday	12/02/2007
Mr Chipasula	Monday	19/02/2007

The reflective interviews were more complex. It was difficult to choose the video clip that would facilitate the interviews because they were many (5 lessons per mathematics teacher educators, one hour each). It was not possible to see all the video clips on their discourse practices in their classes because of the short time for the reflective interviews (one to one and half hours) for the mathematics teacher educators' feedback. However, the incidents that I thought as having particular relevance in relation to the aims of the study were discussed. For example, I looked at how the lessons were presented, their sequencing, the language used, verbal expressions, the way they controlled the lessons and turn-taking in their classrooms. Probing these issues helped me to gain an insight into the social dynamics of the classroom to add meaning to the video recordings, and to get clues about the social identities and positions which were created by and with texts.

Just as with the pre-observation interviews, these interviews were also tape recorded.

Conducting focus group discussions

The discussions in KTTC were conducted with two mathematics teacher educators two weeks after the lesson observations; one was involved in the classroom observations, while the other one was not involved. This was so because of the illness of one of the mathematics teacher educators involved (as described above). The discussions were initiated by showing the mathematics teacher educators some of the video clips of the

mathematics teacher educators who was available for the discussions. Before these discussions, the mathematics teacher educators were asked if we could use their class video clips separately. The interviews took place in the mathematics teacher educator's office. It was quiet and calm.

In CTTC, I conducted the discussions with the two mathematics teacher educators involved. The discussions went well although it was mostly a two-way discussion (Mr Chipasula and I). The other one was very quiet and did not contribute much because he said I was asking difficult questions which he would not be able to answer. I tried to explain the questions further but still he was quiet. His contribution was very minimal.

As in all other interviews, the educators were allowed to use any language that everybody would understand. In CTTC, it was mostly Chichewa that was used, while at KTTC it was mostly English.

5.6 Ethical considerations

Before the process of data collection began, I knew that participants in research have the right to be informed that they are being researched and about the nature of the research (Punch, 1994). Therefore, I had to respect their rights by ensuring that I got permission from the concerned authorities and informed the participants of what the research was all about. The permission to gain access to TTCs and participants was sought (in writing) from the Ministry of Education and the principals. Furthermore, letters of permission were sent to participating mathematics teacher educators and student teachers who signed if they agreed to participate in the research without being coerced and intimidated. In addition, the purpose and focus areas of this research were clearly explained to all the participants in a written form and there was no use of jargon. There were no letters to seek consent from parents because all participants were adults (over 18 years old) and capable of making informed decisions. In Malawi, the legal age of adulthood is eighteen and most students finish secondary school education at the age of between eighteen and twenty. This means that students go for tertiary education when they are above the legal age. (For the consent letters see appendix D)

To ensure that the information gathered was of high quality, it was crucial for me to protect the participants' identities. The participants were assured of confidentiality. According to Rossman & Rallis (2003), confidentiality has two elements, protecting the privacy (identities, names and specific roles) of the participants and holding in confidence what they share with you. Bulmer (1982) says that, to protect privacy and the identity of the research participants, locations of individuals and places are concealed in published results, data collected are held in anonymous form and all data are kept securely and confidentially. In all my research, publications and writing, I assured all the participants and those in leadership positions that no real names and locations would be used unless the participants and the school would give me permission to do so.

Apart from protecting their identities, I also ensured that what they told me remained confidential. In the thesis and any published work, pseudonyms are used to protect the identities of the participants. Information that will lead to clues as to the real names of the participants is confidential and will not be discussed outside this study. A tape recorder and video camera were used when collecting data. The use of these was negotiated with the participants and they had to agree voluntarily.

Therefore, permission and the confidentiality of participants' names and information gathered in the process of data collection were guaranteed. Confidentiality of information gathered in the school was also assured, respecting the wishes of the individuals, groups and colleges that had offered to give the information about themselves and their schools.

5.7 Validity and reliability

To permit analysis and reporting, data that was collected was transformed from its original raw state into a form of representation that is suitable for manipulation and analytical insights. Therefore, all the interviews and discussions that were conducted in this study were transcribed. However, the representation of this data needs to be valid and reliable.

5.7.1 Validity

Validity, according to Hitchcock & Hughes (1989) and Maxwell (1992), refers to the degree to which the findings described by the researcher are the real representation of the data collected. While many discourse analysts reject terms like validity, others such as Lupton (1992) specify criteria for achieving validity in discourse analysis. Lupton (1992) suggests that there are several ways of validating one's assertions (p. 142). These include the inclusion of actual textual material (the data) in a report or paper, which provides the opportunity for others to asses the researcher's interpretation and follow the reasoning process which should have been explained thoroughly. Also Redwood (1999) and Roberts & Sarangi (2005) indicate that, replicating the methods of researchers has been represented as a means of ensuring validity in discourse analysis by following a step-by-step method.

Others address 'validity' by reworking the concept for the purposes of Discourse Analysis. For example, Wood & Kroger (2000, p. 167) propose a series of "warranting claims" to provide justification and grounding for one's interpretive claims. Wood & Kroger are concerned with analysis that is "sound, well grounded on principles or evidence, able to withstand criticism or objection, effective, effectual, cogent" (p. 167). Warranting claims must fulfill the criteria of trustworthiness, soundness, coherence, plausibility and fruitfulness (Nixon & Power, 2007). According to Janesick (2000), trustworthiness attempts to achieve "…procedures that are simultaneously open-ended and rigorous, and do justice to the complexity of the social setting under study." (p. 379). Thus trustworthiness has to do with the soundness of the research. Lincoln & Guba (1985) argue that "trustworthiness has to do with how one persuades his or her audiences that the findings of an inquiry are worth paying attention to, worth taking account of" (p. 290). This according to Lincoln & Guba (1985) includes elements such as credibility and replicability. In this study I used credibility as my main approach to ensure validity and reliability.

5.7.2 Credibility

Lincoln & Guba (1985) explain five different activities that researchers do to ensure credibility in their study. These activities include: activities that make it likely that credible findings and interpretations will be produced; an activity that provides an external check on the inquiry process; an activity that makes possible checking of preliminary findings and interpretations against archived "raw data" and finally an activity providing for a direct test of the finding and interpretations with the human sources from which they have come (p. 301).

These activities were undertaken in this study. For example, several peer consultations were conducted with a supervisory panel and colleagues throughout the study. Issues such as the sample, methodology, methods, the theoretical framework and the framing of the study were discussed in order to establish credibility through pooled judgement.

Another activity that was undertaken to ensure credibility was collecting data from various sources. Carson, Gilmore, Perry & Gronhaug (2001) and Erlandson, Harris, Skipper & Allen (1993), argue that such an approach helps to test the reliability/credibility of the findings through cross-referencing of accounts. In this study, mathematics teacher educators from different backgrounds were involved and, in addition to that, the teacher training colleges were also selected from different regions of Malawi with different cultural backgrounds.

In this study, I have provided a clear and defensible link for each step of the research from the raw data to the reported findings. I tried to ensure that, through the analysis of the data, the information is coherently presented and interpreted in the light of the empirical information in the study. I also present a detailed description of how data was collected and analyzed (Merriam, 1998).

5.8 Limitations and generalisability of the study

This study is interested in the discourse practices of mathematics teacher educators in initial primary teacher training colleges in Malawi. It is based on the interview transcripts made by me and also from the classroom observations. I focus on one

country, Malawi, two teacher training colleges and two mathematics teacher educators from each college. Thus this study is qualitative in nature.

A qualitative approach is less concerned with observing representative cases than it is with observing cases that will yield the insights that it seeks (Manheim, Richard & Willnat, 2002, p. 315). Although these raise questions of validity as well as reliability, the study can act as a guide for other elements or aspects of the discourse practices of the mathematics teacher educators. Thus, the purpose of this study is not to make generalizations about the discourse practices but to fill a gap in the literature by presenting the discourse practices of mathematics teacher educators in Malawi. The point of this research is to make a contribution to the existing literature by presenting critical case studies that shed light on an often overlooked aspect, the discourse practices of the mathematics teacher educators in initial primary teacher training colleges.

I collected a large amount of data and my challenge was to find ways to work with this data that will contribute to answering my research questions. I used a CDA viewpoint to select the data to be used and interpret the findings of this study. Using the CDA approach contributes towards enriching discourse practice patterns or transforming unhealthy or negative social processes that have been identified. For instance, when the identified and analyzed patterns of discourse practices in teacher training programmes reflect dialectic association with conventional practices, or ineffective education process, implies that this finding is brought to the attention of society, specifically those implicated in education. As such, those concerned can conduct improvements or adjustments to the discourse, policy makers may, for example, adapt the teacher training curriculum.

There were also other unforeseen circumstances where one of the participants got sick in the process of data collection and one withdrew on official duties, and therefore these had to be replaced by other mathematics teacher educators in the middle of the data collection. Nonetheless, the change of teacher training colleges and the inclusion of the

mathematics teacher educators during data collection did not in any way impair the central line of argument in this study.

5.9 Summary and conclusion

This chapter has outlined the research design, the methods of data collection, and the detailed research process as used in this study. The methods used are informed by the CDA methodology in addition to the research questions. Also since the procedure was qualitative in nature, the methods of data collection used were consistent with the dictates of qualitative research. Issues pertaining to the reliability and validity of this research as well as ethical considerations that guided me in the process were also discussed. The limitations and generalisability of this research were also explained.

I now give, in the next chapter, a detailed description of the data analysis employed in this study.

CHAPTER SIX

DATA ANALYSIS AND PRESENTATION

6.1 Introduction

Thus far, I have presented my theoretical framework and CDA methodology in chapters 4 and 5, and outlined the supporting methods of sampling and data collection techniques. In so doing, I have highlighted and drawn attention to the underlying elements of CDA theory. All this has helped to set the context and background for this research which attempts to understand the discourse practices of the mathematics teacher educators in initial TTCs.

This chapter outlines the process of data analysis employed in this study. I will present, first of all, the process of transcription that was done. Thereafter, I will present the process of analysing data to demonstrate and explain how I have used CDA in the analysis in chapters 7 and 8. Although this is presented in a linear form, the process involved moving to and fro between the three stages of analysis.

6.2 Transcription

Data analysis proceeded both during and after data collection. The first step involved transcribing all interviews and classroom observations so that I should have written texts. I transcribed all the interviews and classroom observations alone. This task was time consuming and very difficult. In my transcription, I aimed for consistency while acknowledging the analytical process that transcription involves and the challenges inherent in attempting to produce accurate re-presentation of taped conversations (Lapadat, 2000 in Tilley & Powick, 2002). First, I constructed a set of transcription conventions that I followed (Tilley & Powick, 2002). These conventions helped me to remain consistent in the transcription process. For example, I transcribed everything, writing the Chichewa words in Chichewa and English words in English. Table 6.1 presents the conventions that I constructed.

Table 6.1: Conventions used in the data of this study.

Symbol	What the symbol stands for
L	the mathematics teacher educator
Ss	all student teachers
()	short pause
!	refers to raised inflexion in places where a question mark would not be appropriate
(…)	Inaudible
[…]	my interpretation
L & Ss	the mathematics teacher educator and all students
S6 & S7	two different student teachers whose names are not used
SG1 & SG2	student teachers representatives from two different groups

As a means of reducing errors and maximizing the transcription quality of my study, I reviewed each transcript produced. With the completed transcript in hand, I returned to the audio and video tapes, listening and comparing tape and text to ensure as much as possible that there was agreement between what was said and the way it was represented in the text. The most common errors were gaps, omissions, misspelt words, misunderstood words and missing communication that included variations in volume, pitch and quality of voice, as well as length of silences (Gorden, 1980). By reading the transcripts and listening to both audio and video tapes more than once, I was able to reduce these errors and I added some non-verbal cues wherever I found them to be necessary for better understanding of the text.

One of the difficulties in transcribing bi/multilingual data is the issue of translation from one's home language to English. All the lessons I observed were done in English and I conducted the interviews in English as well, but I gave the participants the freedom to use Chichewa. I made this decision consciously because I knew from experience that the mathematics teacher educators might be more comfortable speaking Chichewa rather than English. However, there was a lot of English that was spoken during interviews and most of the interview and classroom observation data was in English.

Nevertheless, any part of the data that was in Chichewa and was considered in the analysis of this study and later found its way into this thesis had to be translated. It was noted that Chichewa words that were mostly used were short phrases or just a single word at the end of the sentence. For example, words like "*eti*?" meaning "not so?" As a result I did not face any challenges in linguistic, syntactic or grammatical aspects in the process of translation, particularly with regard to the data that has been quoted in this thesis.

In the next section, I present how I have used CDA in analyzing the data used in this study.

6.3 The Process of data analysis

I am using Fairclough's CDA to analyze the texts – transcripts from the interviews and classroom observations, which were all in electronic form. However, it is certainly not possible to do CDA on all the transcripts. This was my challenge - to find ways to work with longer texts that would contribute to answering my research questions and at the same time identify shorter pieces of text (critical incidents) for CDA which would later act as evidence of my claims made on the wider data. In doing this, the transcripts (both interviews and classroom observations) were divided into manageable sections based on naturally occurring divisions. These divisions were signalled by a change in theme, or direction such as when class discussion on a particular problem was concluded.

The analysis of the selected sections comprised of Fairclough's three inter-related stages of CDA (Fairclough, 2001); textual analysis, discourse practice analysis and social process analysis. The last stage takes into consideration the underlying socio-cultural and power structures in society (Fairclough, 1992).

6.3.1 Level one: Textual analysis

Textual analysis is the analysis of the actual text, and the main object of analysis is the text itself (both verbal and non-verbal) (Fairclough, 2001). This stage involves analytical reading in order to highlight formal features of the text. In the analysis of this study, this stage was done in two parts. The first part involved analytical reading of the

selected texts (interviews and classroom observations) in order to highlight formal features such as vocabularies (wording), utterances, and grammar (transitivity, modality) to identify representations, constructions of the mathematics teacher educators' and student teachers' identities (Fairclough, 1995), and how both the mathematics teacher educators and the student teachers were positioned, and instances of power relations in the use of language. During this process, I followed the systematic guiding questions formulated by Janks (2005). The questions that I followed are, in their order:

1. How is language used to construct a representation of the multilingual classroom?

2. How do key linguistic features work to position the mathematics teacher educators and the student teachers in a multilingual classroom? Do they pull in the same direction? Is there a pattern?

3. How does the overall construction of the text – logical reasoning, visual selection and organization, interaction patterns – contribute to this presentation?

4. Are there internal contradictions?

For example, one of the features that I focused on is how pronouns such as "you", "they", "them" and "we" were used. After highlighting these pronouns, it seemed that they suggested particular set of roles and identities of both the mathematics teacher educators and the student teachers in a college mathematics classroom. For example, in extract 6.1 it became clear that the pronouns chosen in the text are doing something interesting.

Extract 6.1

> *we are trying to teach addition of fractions; we normally start with simpler things which pupils can appreciate, that is, they can easily see that is why there is need for us to model the addition of these fractions, and to do that we are going to use a rectangle with eh some subdivisions and for this sum of one over five plus three over five. First of all, there is need for us to model the addition process as follows; draw a rectangle as*

> *I have done this one (pointing to the rectangle), it has to be a rectangle or a circle,*

In this text, the pronoun "*we*" is used to exclude the student teachers and positions the mathematics teacher educators as professional experts who have all the experience and knowledge required for mathematics teaching. This position is further confirmed by the use of directives such as "*draw as I have done*" and "*it has to be a rectangle*".

Extract 6.2 gives another example where "we" is being used to include the students.

Extract 6.2

> *Let us continue from where we stopped (putting a chart on the chalk board) that's ah, skills, that is three or four skills, the first one is going to be changing mixed numbers to improper fractions, that is we have to change these numbers to improper fractions, which are similar or the same denominators, we will start with changing mixed numbers to improper fractions. ah the activity says, let us use a number line, let us use a number line, to show that, two four fifth is equal to two plus four fifth, now two plus four fifth, we are doing that activity together as a class …*

The first part of this episode where the mathematics teacher educator was demonstrating, he used the first personal pronouns "*we*" and "*us*". The use of these pronouns suggests the identities and positioning of both the mathematics teacher educator and the student teachers and the expected roles to be done by them according to their positions. In extract6.2, the way "*we*" is used identifies both the mathematics teacher educator and student teachers at the same position holding the same identity (that is as teachers), and what they are supposed to do when teaching the addition of fractions which have the same denominators.

After highlighting the vocabulary, pronouns and the grammar, the analysis then shifted to looking at patterns of co-occurrences of words in text, looking at which words most frequently precede and follow any word which is in focus (Fairclough, 2003, p. 131). Of specific interest were how the elements of a multilingual classroom were presented, the patterns of discourse practices that were being produced by the mathematics teacher educators from what they said and did, whether there were any contradictions or not. This allowed me to see the absence or inclusion of specific characteristics of the

discourse practices of a multilingual classroom, what is emphasized (foregrounding), and what is not (back grounding). For example, notable absences in the transcripts include absence of questions asking the student teachers where they did not understand; absence of transitions in the examples solved to help build relationships with student teachers, absence of any positive comment or any appreciation when the student teachers gives the solution, and infrequent use of home languages. Through this examination of the transcripts of the mathematics teacher educators, I identified preliminary themes that would describe the kinds of discourse practices that came from the pattern developed from their utterances.

The second part of the textual analysis, which I considered in this thesis, relates to the patterns of interaction between the mathematics teacher educators and the student teachers in order to identify forms of discourse practices that are being produced in a college mathematics classroom. While the first part of textual analysis was done on both the interview and classroom observations transcripts, this second part was done on the classroom observations transcripts only as I gave specific attention to the particular ways in which the mathematics teacher educators interacted with the student teachers and how "elements of social events were represented" (Fairclough, 2003, p.133) in a college mathematics classroom. I focused on highlighting the textual features such as who controls the interaction, turn-taking and the structure of change in discourse, whether or not the mathematics teacher educators interact with student teachers (either turn-taking in the discourse or simply presenting material) and whether the student teachers ideas are taken into account as the lessons proceed. This in turn initiated my thinking and understanding of the discourse practices that are being produced in a college mathematics classroom. After highlighting the textual features, I then proceeded to level two, discourse practice analysis.

6.3.2 Level two: Discourse practice analysis

This second stage was the interpretation of the relationship between text and interaction. At this stage, the text is seen as the outcome of a course of action and as a resource in the process of interpretation (Fairclough, 2001). As Waller (2006) puts it, at this level

> The researcher analyses what are the factors (social relations, instruments or materials, objects, time and place, forms of consciousness, beliefs/values/desires and institutions/rituals (Fairclough, 1999, 2003) which may explain the social constructions of an interviewee's response, for example in terms of the production of texts. In so doing the researcher analyzes the consumption and interpretation of texts and the transformations they undergo as a result of the interpretive process. At this level, an interpretation of discursive practices in relation to events, inter-discursivity, discourses, and orders of discourse is undertaken. Such information can provide insights into the production/distribution, consumption/interpretation, and transformation that a discourse undergoes (the influential elements and their configurations). (Waller, 2006, p. 117).

At this stage, the analysis involves highlighting words and phrases of the text that are seen cumulatively and in relation to each other and to the wider context, which are then interpreted, in terms of particular epistemological and ideological beliefs of the participants. The analysis involves both micro and macro-level interpretation of not only the production of discourse, but also its procedures (Fairclough 1992, p. 65 & 134).

In this study, this process was done by highlighting words and phrases of the text that were seen cumulatively and in relation to each other and to the wider context. The texts that were seen accumulatively were then connected– at the micro level, to the discursive practices around their formation. While doing this, I asked several guiding questions. Some of the questions asked included the following, adapted from Janks (2005) and Johnstone (2002, 227 – 238).

- Who is speaking to whom? When? Where? On what occasion? Why?
- How many languages are being used in the classroom? At what time? For what purpose?
- Who is speaking what language? For what purpose?
- What relations exist between the student teachers and the mathematics teacher educators?

- What is the discourse type in the text?
- Which voices are included\excluded in the text?
- How are the lessons being presented?
- Who has authority of the mathematics being taught?
- How are the mathematics teacher educators being presented? (Experts/non experts?) How are the student teachers presented? (active/passive, personal/impersonal?)
- What styles (approach) of teaching are being presented, and how are they textured together? Is there a significant mixing of styles?

Applying these questions on the data, I was able to identify the languages that are being used in the classrooms, for what purpose, who speaks what language. This process allowed me to see whether code-switching is practiced in college mathematics classrooms, and if the code-switching is spontaneous or not. In so doing, I began to have an understanding of the language practices of both the mathematics teacher educators and the student teachers in a college mathematics classroom and how these language practices are being controlled. At the same time, I began to understand how the mathematics teacher educators' involvement in training the student teachers on how to use multiple languages and how they would implement the LiEP that allows the use of local languages in a multilingual classroom.

In addition, I could see ways of how the student teachers and their mathematics teacher educators relate to each other in a college mathematics classroom, the power relationship that exist between them, ways of relating in general and ways of identifying both the mathematics teacher educator and student teachers including any assumptions being made and some discourse specific words (Hanrahan, 2005) produced by the mathematics teacher educators. I was also able to identify what is valued and what is not in terms of what the student teachers need to know and engage with in a college mathematics classroom.

Furthermore, this process led me to the understanding of the discourse practices that are displayed by the mathematics teacher educators in a college mathematics classroom. Aman & Mustaffa (2006) argue that identifying the discourse practices is rooted in the obligations felt by the mathematics teacher educators and student teachers in accordance with perceived roles in the college mathematics classroom and these are enacted through classroom practices. Such interactions, most often embedded in language, comprise the patterns of interaction in the classroom. For example, a mathematics teacher educator's felt obligation to clarify a student teacher's thinking might be enacted as a practice in which the mathematics teacher educator asks a series of instructional questions, for example, for which the mathematics teacher educator already knows the answer (Wertsch & Toma, 1995). These questions are designed to lead the learner step by step to the correct solution. Simultaneously, the student teacher's obligation to give the mathematics teacher educators a desired response might lead to a routine of guessing by that student teacher (Wertsch & Toma, 1995). Together, these practices comprise a discourse practice in a mathematics classroom.

At this time, tentative conclusions and themes emerged which led me to the analysis of additional data to test the conclusions and the themes. Sections from the transcripts of the classroom observations were subsequently selected as representative of the patterns manifested in the discourse. Other data sources (e.g. other classroom observations, reflective and focus group interviews) were perused for confirming assertions generated through my analysis. Through this process, I merged other themes based on commonalities between and among language. That is, common assumptions were forged together to come up with the discourse practices produced by the mathematics teacher educators.

Fairclough's tools up to this level in this study have been used to study the interview and classroom observations texts in a social context. For my purposes, I needed to include tools for identifying and describing the linguistic acts that mathematics teacher educators produce within each discourse practice that has been identified from the second stage of analysis. Acknowledging that there are different linguistic acts done by mathematics teachers in a classroom, Luk & Lin (2006) point to certain features of

these linguistic acts, particularly ways of using a range of linguistic acts for procedural control in a mathematics classroom. Luk & Lin (2006) describe a range of these linguistic acts, from least to most direct and authoritative, that teachers can display in a mathematics classroom. Table 6.2 indicates some of these linguistic acts.

Table 6.2: Directives with varying degrees of authoritativeness (Luk & Lin, 2006)

Most direct and authoritative  least directive and authoritative	1. Strong command, for example, hands up, shut up, listen,
	2. Shushing for example, shh
	3. Direct imperatives e.g. take out your books
	4. Polite imperatives e.g. take out your books please
	5. Declaratives e.g. I'd like/want to have three volunteers
	6. Teacher-Inclusive imperatives as suggestion e.g. Let us write it on the board
	7. Interrogatives as requests. E.g. Can you move forward
	8. Interrogatives as suggestions e.g. Shall we do this exercise now?
	9. Interrogatives as invitations e.g. Would like to try the next one?

Applying Lik and Lin's framework in table 6.2, I illuminate the type of linguistic acts embedded in the discourse practices that are commonly used by the mathematics teacher educators in college mathematics classrooms and the knowledge system, beliefs, values or perceptions regarding social relationships and identities that are embedded in discourse (Fairclough, 1992, pp. 75 – 78, 234 – 237; 1995a, pp. 133 - 134). Lastly, although this was not done in this linear sequence, but for easier explanation, I then proceded to the last level of analysis – Social process analysis.

6.3.3 Level three: Social process analysis

This stage also called ‘explanation stage’ is concerned with the relationship between interaction and social context. It extends the interpretation into an explanation of the findings found in the descriptive and interpretation stages. The aim of this stage is concerned with revealing the social issues and practices that are embedded in discourse through its dialectic relationship with the nature of texts and discourse practices (Fairclough, 2003). In other words, I considered the socio-historical conditions that govern the process by which the discourse practices are being produced in a college mathematics classroom; the social, institutional, and situational practices that shape the discourses identified.

The findings at this stage were compared against the existing literature (chapters 2 - 3) and the practices of various discursive events that take place in multilingual school mathematics classroom in order to identify possible links based on historical, social, institutional and situational influences. For example, comparing the discourse practices found in stage two to the discourse practices that are produced in a multilingual classroom and its historical influences, reveals whether the discourse practices identified have been produced conventionally, that is practices indicating the act of production centering on the ‘societies’ view of good practice’ or not. This process helped me in understanding and explaining the circular logic at work – how and why some discourse practices “shape beliefs, fantasies and desires so as to regulate practices of institution building that set the stage for material production and reproduction activities that in turn construct social relations …” (Harvey, 1996, p. 82). Furthermore, the discourse practices helped me to understand the learning of how to teach school mathematics was socially organized, how the mathematics teacher educators socially constructed social relations, factors that influenced these constructions, who influenced whom and to what end. This also includes the understanding of the role of the wider ideological processes and power structures as well as possibilities of change and resistance.

Furthermore, to give an explanation of the findings from the interpretation stage, I adopted the three ways that Fairclough (2003) saw discourse as figuring in social practices; ways of representing, ways of acting and relating, and ways of being.

About ways of representing, I considered how the mathematics teacher educators represented the discourse practices in a college mathematics classroom and also how the teaching of school mathematics was represented, that is, the common sense assumptions that underlie the discourse practices, what is taken for granted in their discourse practices; what is presented as natural; whether the discourse practices identified work to sustain or transform existing power relations; and the tensions that exist. This was indicated by the different ways of talking/of the use of linguistic acts that were being produced during their teaching, by the ways they kept and shared control between the mathematics teacher educators and student teachers, and by the way the teaching environment was represented either as a workplace or as a learning community where people share their ideas to shape each other.

There were also several other ways of aspects of acting and relating in the college mathematics classroom that relate to Faircloughs' (1989) notion of ways of acting and interacting. They include aspects related to their teaching styles, and to the type of dialogue that has been used. Dialogue (as defined by Lemke (1990)) has implications in terms of power-sharing and the development of student teachers' self-sufficiency and personal decision-making.

Ways of identifying mathematics teacher educators' and student teachers' roles were also considered. One's way of identifying both oneself and others is highly related to one's way of representing the world and one's way of acting and relating interpersonally. However, each has its own distinctive features (Hanrahan, 2005). In the texts in question, this is exemplified in the roles (Fairclough calls these "ways of being") afforded to participants, and in the differing ways the teachers identified themselves and their learners. For example, mathematics teacher educators identify themselves as experts, presenters of knowledge, facilitators, and as evaluators of student teachers' presentations. Such mathematics teacher educators' roles needed

corresponding student teachers roles to function effectively. So I looked at the roles of the student teachers in a college mathematics classroom that complemented the mathematics teacher educators' roles.

6.4 Conclusion

In this analysis, I identified the discourse practices that are produced by the mathematics teacher educators from their descriptions of a multilingual classroom and also the discourse practices produced in a college mathematics classroom. Thus in the next two chapters (chapters 7 and 8), I present the findings of this analysis.

In chapter 7, I discuss how the mathematics teacher educators describe a multilingual classroom, as well as their views on the use of different languages in the classroom. The descriptions that are discussed are compared against the literature presented in chapter 2 and 3 in order to highlight the consistencies as well as the tensions that exist between the two institutions, a college mathematics classroom and a school mathematics classroom. Furthermore, it also discusses the mathematics teacher educators' discourse practices in relation to the LiEP, and the tensions that exist because of the LiEP at tertiary education level.

Chapter 8 discusses the discourse practices that are commonly used by the mathematics teacher educators in a college mathematics classroom which are then compared against the literature of chapter 3, where the common discourse practices produced in multilingual mathematics classrooms are discussed. The aim here is to illuminate the discourse practices that student teachers are exposed to during teacher training programmes, which in turn reflect what is and what is not in teacher training colleges in terms of training the student teachers to teach mathematics in multilingual classrooms.

CHAPTER SEVEN

MATHEMATICS TEACHER EDUCATORS DISCOURSES ABOUT MULTILINGUAL CLASSROOMS

7.1 Introduction

This chapter provides the first level of analysis focusing mostly on the pre-observation interviews that were conducted with the mathematics teacher educators in initial teacher training colleges (TTCs). The pre-observation interviews act as an instrument and a window to draw and see what mathematics teacher educators have to say about multilingual classrooms.

In this chapter, I present a discussion of mathematics teacher educators' discourses of a multilingual classroom. I found that the mathematics teacher educators regard the use of other languages as a problem rather than a resource. Analysis of data also reflects that code-switching in a college mathematics classroom is not as spontaneous as research shows it to be in schools; rather it is very much controlled and restricted. This chapter also shows that the mathematics teacher educators recognize the language challenges that exist in multilingual classrooms but struggle to find solutions. Furthermore, the chapter highlights the role that mathematics teacher educators play in not only addressing the needs of the student teachers but also directly helping the student teachers with how they can implement the LiEP when they begin to teach. However, the application of the LiEP in their college classrooms seems to be problematic.

Thus in this chapter, I present three general themes that came from the data which are:

- The place of home languages in a college mathematics classroom
- Solutions to the challenges that exist in multilingual mathematics classrooms
- Mathematics teacher educators talk: Policy into Practice

These themes are supported by quoted texts from pre-observation interviews, classroom observations and reflective interviews with the mathematics teacher educators. The quotes represent critical incidents that the mathematics teacher educators articulated.

To enable the reading of the discussion in the context of the mathematics teacher educators, this chapter commences with a recap of the Language-in-Education Policy in Malawi and the mathematics teacher educators' language background.

7.2 Recap of the background

Language-in-Education Policy in Malawi

Malawi uses English as an official language and Chichewa as a national language. The Language-in-Education Policy requires that learners in the first four years of schooling should be taught in their home languages (Ministry of Education, Sports and Culture [MoESC], 1996). In other words, Malawi government policy indicates that English still remains the major LoLT for all the classes in upper primary, secondary (high) and tertiary education.

Mathematics teacher educators and their home languages

The four mathematics teacher educators to be presented here come from different regions and have different home languages. Mrs Joshua and Mr Lukhere come from the northern region of Malawi and Chitumbuka is their home language. Apart from Chitumbuka, these mathematics teacher educators can speak Chichewa (since it is a national language) and English as the official language. Both of them were teaching at Kachere TTC in the southern region of Malawi. In their classes there were four major languages: Sena, Lomwe, Chichewa and Yao. These classes had very few student teachers who could speak the mathematics teacher educators' home language, Chitumbuka.

The other two mathematics teacher educators, Mr Otani and Mr Chipasula come from the central region and they both speak Chichewa as their home languages. The other language that they can speak is English as the official language. These two were

teaching at Chayamba TTC located in the central region of Malawi. In their classes, there were two major languages: Chichewa and Chitumbuka. However, both of these mathematics teacher educators neither understand nor speak Chitumbuka.

7.3 The place of home languages in a college mathematics classroom

Applying the process of textual analysis and discourse practice analysis as described in section 6.3.1 and 6.3.2 on the pre-observation interviews, it was found that all the mathematics teacher educators agree that a multilingual classroom is where different languages are spoken. However, they seem to differ on who speaks these languages. Two of them explained that a "*multilingual classroom is where students speak different languages*" and the remaining two seemed to say that a "*multilingual classroom is where we use two or more languages*". These two explanations were given in response to the question regarding their understanding about a mathematics multilingual classroom. Extract 7.1 below represents two texts from the two mathematics teacher educators who stated that a multilingual classroom is where students speak different languages.

Extract 7.1

Mr Otani's and Mr Lukhere's responses:

Mr Otani: *all right, a multilingual classroom is a classroom where by ah, students express themselves in different languages, such as Chichewa, English, Chitumbuka or Yao. So that one, that's what we call a multilingual classroom.*

(Transcription, 05/02/2007)

Mr Lukhere: *multilingual classroom may be should refer to a classroom where the combination of students is that, ah which those students they speak different languages.*

(Transcription, 09/01/2007)

In both texts, the common feature is the phrase "different languages". Both explained that a multilingual classroom is about speaking different languages. However, the choices of the language used in these texts represents the way in which they assume

"who" speaks these different languages in a multilingual classroom. Mr Otani says "…. *whereby ah students express themselves in different languages* …" and Mr Lukhere says "… *those students speak different languages* …" The picture being represented in these texts of Mr Otani and Mr Lukhere suggests that a multilingual classroom is where students speak different languages, suggesting that they consider the use of different languages spoken by the students only. Their statements are silent about the mathematics teacher educators speaking another language other than English in the classroom. Therefore, they exclude their own home languages from the languages present in the classroom. This claim is further supported by data presented below.

The next two texts in extract 7.2 represent the description of the other two mathematics teacher educators who explained that a multilingual classroom is where "*we*" (meaning both the mathematics teacher educators and the student teachers) use two or more languages.

Extract 7.2

Mr Chipasula's response:

> **Mr Chipasula:** *multilingual classroom is a classroom whereby we use two or more languages*
>
> (Transcription, 12/02/2007)

Mrs Joshua's response:

> **Mrs Joshua:** *ah, multilingual in my understanding, multilingual is about using different languages*
>
> (Transcription, 08/01/2007)

The use of this language suggests the inclusion of the mathematics teacher educators' use of different languages in the mathematics classroom. It may imply that they, too, speak languages different from English. The assumption here appears to be that the mathematics teacher educators speak other languages in class apart from the language of learning and teaching. Unlike the previous two texts, Mr Chipasula's and Mrs Joshua's texts appear to include their home languages as part of the languages present in

the classroom and it reflects that they are part of the system just as the student teachers. Mr Chipasula says "…*we use two or more languages*" and Mrs Joshua says that "… *is about using different languages*". This language represents the way in which the mathematics teacher educators may be considered as holding the same language identity as the student teachers.

Although these mathematics teacher educators differed on who speaks home languages in a multilingual classroom, they explained that their classes are multilingual because "*their students fail to express themselves in English and so they use other languages such as Chichewa and Chitumbuka*."

Extract 7.3

R: *okay, how can we classify your class, the class that we will be visiting, should we expect that it's a multilingual or ...*

Mr Otani: *yah, that one is multilingual because there are some who cannot express themselves in English so we accept Chichewa*

(Transcription, 05/02/2007)

Mr Chipasula

R: *so if we consider your definition of a multilingual classroom, can we say that, or is your class multilingual?*

Mr Chipasula: *yes, it's multilingual in the sense that our, sometimes, our students fail to express themselves, so they are free to use Chichewa*

(Transcription, 12/02/2007)

Of the many things which the texts in extract 7.3 may suggest, what comes to the forefront is the mathematics teacher educators' association of "multilingualism" with "failing to express themselves in English." According to the explanations given by the mathematics teacher educators as to why their classrooms are multilingual, Mr Otani and Mr Chipasula explained that their classes are multilingual because there are (some) student teachers who fail to communicate in English and so the student teachers are allowed to express themselves in Chichewa. Subsequently, their classes are multilingual not because student teachers speak different home languages but because the student teachers are allowed to speak Chichewa if they fail to speak in English. This raises the

question of whether, if the student teachers were able to explain themselves in English, the class would cease to be multilingual.

In another instance, Mr Otani said the following words:

Extract 7.4

Mr Otani: *I had a lot of problems [meaning when he was teaching mathematics at primary school] so here in TTCs, here we have problems, some of the students cannot express themselves in English that is why for us to help them, we have to accept them, they have to speak Chichewa or Chitumbuka, or (not clear)*

(Transcription, 05/02/2007)

Mr Otani explains that one of the problems that he faces is that his student teachers fail to express themselves in English, and a way of helping the student teachers is to allow them to use their home language(s). Thus multilingualism is seen as a problem.

Skiba (1997) suggests that in the circumstances where code-switching is used due to an inability of expression, it serves for continuity in speech instead of presenting interference in language. In this respect, code-switching stands to be a supporting element in communication of information and in social interaction; and therefore serves for communicative purposes in the way that it is used. Even though multilingualism is seen as a problem, the emphasis in the extracts presented above is that student teachers need to be helped in expressing themselves by the use of their home languages. This suggests that home languages in a college mathematics classroom are being used for continuity purposes (Skiba, 1997) in the student teachers' explanations. There is a notion that student teachers are not able to express themselves in English and allowing them to switch to their home languages is seen to compensate for the deficiency. Thus code-switching is done in the college mathematics classroom to help student teachers learn to communicate.

This argument is supported further by the following statement made by Mr Chipasula:

Extract 7.5

Mr Chipasula: *yah, sometimes, because of this switching, we, some students feel free to participate, because you can see when we are strict to say no, explain in English one fails to explain, but when we say, 'can you explain in Chichewa', find out he or she is able to explain.*

(Transcription, 12/02/2007)

It is clear from this extract that Mr Chipasula is concerned with the student teachers being able to express themselves in English, and so he allows the student teachers to use home languages (Chichewa) to help themselves explain better.

However, the switching discussed here seems not to be the same as the switching discussed in chapter 3. In chapter 3, section 3.3.1, it was discussed that, in multilingual classrooms, both teachers and learners code-switch freely between their utterances (Martin, 1996; Mwinsheikhe, 2001; Setati, 2005b). In these college mathematics classrooms student teachers have to be *allowed* to switch or given the opportunity to switch. The power to grant them the opportunity to switch lies with their mathematics teacher educators. For example, in one of Mr Otani's classes, one of the student teachers had difficulties in trying to communicate to the whole class. This student teacher switched only when he was told by Mr Otani to switch. When I followed it up with Mr Otani during the reflective interviews, he said the following:

Extract 7.6

Mr Otani: *ah, it's because they are used to speak in English, they know that this is college; they cannot be allowed to speak in Chichewa,*
R: *ummhu*
Mr Otani: *aha, that is why they speak English, they switch to another language unless if they are given that freedom*
R: *without that they can't*
Mr Otani: *ah, they can't*

(Transcription, 05/02/2007)

If the chance to code-switch is not given then the student teachers are not allowed to switch. That is, it is the mathematics teacher educators who have the power to

say when to switch to one's home language. Thus switching is very much controlled more especially in the public domain.

In a similar situation Mr Lukhere said that

Extract 7.7

Mr Lukhere: *am not strict [to say English only], ah I have cases where students have explained items in Chichewa, so am not very strict, just because I know that they are not supposed to use Chichewa …. And they know that*

(Transcription, 09/01/2007)

Extracts 7.6 and 7.7 serve to confirm that even though the mathematics teacher educators know the benefits of using home language, code-switching is not practiced freely, more especially in the public domain. The reason given is that it is college; every student teacher is expected to speak English. This finding seems to be different from the results reported by Setati (2005b) and other researchers that in multilingual primary mathematics classrooms code-switching is encouraged, and that the learners' home languages can be regarded as a resource and not as a problem in the teaching and learning of mathematics. That freedom and encouragement seem not to be present at college level. Thus, even though the mathematics teacher educators involved in this study were supportive of the ideas behind using the home languages in their classes, the student teachers have to be allowed to speak in another language. They are not "free" per se to switch when they feel like switching. Thus, just as multilingualism is seen as a problem, code-switching is also seen as a problem even though it is used.

Despite the presence of other languages in the classroom, student teachers used Chichewa only when they were given that chance. Mainly this was because almost everyone understands and can speak Chichewa. However, there were situations where a student teacher was not able to express him/herself in Chichewa and English. In this situation, student teachers were allowed to use Chitumbuka.

Extract 7.8

R:	*okay, are there maybe some students who can express themselves like in Chitumbuka in your class?*
Mr Otani:	*yes, there are so many from the north*
R:	*okay, so do they may be sometimes use that Chitumbuka?*
Mr Otani:	*yah sometimes, yes*
R:	*so what happens like yourself, do you understand?*
Mr Otani:	*ah, sometimes there is a breakdown of communication since I don't understand much of Chitumbuka, so there is sort of breakdown in communication, but I know (not clear)*
R:	*okay, so it's like when you are in a class, for example if you ask a question like in English and there is a student who cannot express himself maybe fully in English or fully in Chichewa*
Mr Otani:	*yah*
R:	*he can explain it in Chitumbuka*
Mr Otani:	*in Chitumbuka*
R:	*no problem*
Mr Otani:	*no problem*

(Transcription, 05/02/2007)

In Mr Otani's words, he explains that it is mainly English and Chichewa that are normally used in his mathematics classroom despite the presence of the other main language, Chitumbuka. However, sometimes he allows Chitumbuka in his class. This was observed in one of his classes where one of his student teachers used Chitumbuka after he failed to speak in English and Chichewa.

Extract 7.9

Mr Otani:	*Can you explain in Chichewa*
S2:	*ah in Chichewa that's when I will be totally lost*
Mr Otani:	*okay*
S2:	*laughing*
Mr Otani:	*Okay, what about in Chitumbuka?*
S2:	*yah in Chitumbuka, no problem, (Student teacher explains in Chitumbuka)*

(Transcription, 05/02/2007)

The student teacher had to be told to use Chitumbuka, otherwise he was not supposed to use it. The problem however, was that not all understood what the student teacher said,

including the mathematics teacher educator himself. In spite of this, Mr Otani still allowed it. Similarly Mr Chipasula was observed to do the same thing as Mr Otani that is, allowing Chitumbuka to be used even though he also did not understand this language.

Extract 7.10

R: *so what about like maybe like Chitumbuka, you said most students speak Chichewa and Chitumbuka, I don't know, are they allowed to use Chitumbuka*

Mr Chipasula: (*laughing) sometimes they, when they fail to express or to say anything in Chichewa they speak Chitumbuka but not to that extent*

R: *okay*

Mr Chipasula: *maybe they know that many of us don't understand Chitumbuka*

R: *okay, now*

Mr Chipasula: *but when you ask them to discuss in groups you can hear some Chitumbuka*

(Transcription, 12/02/2007)

In this case one wonders as to why these mathematics teacher educators allowed student teachers to use Chitumbuka when they and half of the student teachers did not understand it. Mr Otani made the following comment after one of the student teachers used Chitumbuka to explain what he wanted to say.

Extract 7.11

Mr Otani: *So he has explained it clearly [meaning explanation in Chitumbuka], not so?*

Ss: *yes*

Mr Otani: *to some of us who understands Chitumbuka, we have heard*

Ss: *yes*

Mr Otani: *but to you who do not understand, ehh that's your problem*

Ss: *[laughing]*

(Transcription, 05/02/2007)

It is clear from this extract that the issue is to accommodate everybody in the class and so to allow the student teachers to be able to express themselves. The mathematics teacher educators would allow Chitumbuka in order to give encouragement or to

motivate those student teachers who could not express themselves in English or Chichewa. As a result of this action, student teachers and mathematics teacher educators may build intimate interpersonal relationships among themselves in the classroom. These views echo what Guthrie (1984), Setati (2005) and other researchers reported that the home language of the learners can be a language that indicates group membership and personal connections. Thus from these extracts, it appears that the use of home languages as a "we-code" is also upheld in a college mathematics classroom.

As expressed by other researchers, for example Adler (2001), the mathematics teacher educators in this study limited the use of code-switching because of the feeling that too much switching into the home languages may undermine the student teachers' learning of English and their ability to perform well during examinations at national level.

Extract 7.12

> **Mr Chipasula:** *we try as much as possible to run away from these local languages. Write in Chitumbuka or Chichewa and the examiners, the one who will be marking, will say, 'ah no, this is English grade', so that's another challenge, when you are trying to compare the understanding of students in the classroom and the performance at national level*
>
> (Transcription, 12/02/2007)

Mr Chipasula was concerned about the examination-oriented curriculum. He wishes he could use more of the local languages in his class, but when he thinks of the examinations he gives himself a limit, so he says. "*We try as much as possible to run away from these local languages,*" meaning that he tries as much as possible not to use the local languages. This sounds like a contradiction to his statements that "*students are free to use Chichewa.*"

This suggests the conflict that exists between Mr Chipasula's efforts to use local languages and what the curriculum prescribes. Cummins (1996) argues that educators are faced with choices and constraints with respect to what and how we teach, the nature of our personal goals in teaching, and the kind of aspirations we have for the learners we teach. What Cummins (1996) argues for might be possible to some extent,

but the exam-oriented syllabus poses a threat and is a source of conflict for the educators in implementing their goals, just as Mr Chipasula explains it.

This section has shown that both multilingualism and code-switching are seen as a problem, even though the benefits and positive effects of code-switching in the classroom are clear to these mathematics teacher educators. It is also seen that, when it comes to the use of other languages in their classrooms, what they actually do contradicts what they say. From what they say, it seems that they support the use of student teachers' home languages, while in practice they do not encourage code-switching in the sense that the student teachers' have to be told when to switch. Thus code-switching is not spontaneous for the student teachers. Code-switching occurs at only a few specific points and serves a particular purpose. These purposes include: communication purposes and for accommodating each other.

More importantly, the mathematics teacher educators' contradictions of what they say and do about code-switching are also further confirmation of the dilemmas of being an African teacher educator. Like many African teacher educators in Malawi and other commonwealth countries in Africa, they know that they must enhance their student teachers' exposure to the English language, overcome their own sense of inadequacy in that language, and ensure that their student teachers are prepared to use English for their teaching and the outside world, so they must not code-switch. At the same time they must ensure that student teachers are able to express themselves and participate in classroom talk, even if the mathematics teacher educators do not speak the language.

7.4 Solutions to the challenges that exist in multilingual mathematics classrooms.

Another observation made from the analysis of the interviews is that the mathematics teacher educators involved in this study recognise the challenges that exist in multilingual mathematics classrooms but struggle to find solutions. This observation was made from the responses that mathematics teacher educators gave when they were asked about the language challenges that mathematics teachers meet in a multilingual classroom. This question was asked with the aim of finding out if they know the

environment in which the student teachers that they are training are soon going to teach. Some of the challenges that were mentioned by all the participating mathematics teacher educators in the interviews are: limited vocabulary for mathematical terms in local languages, failure of mathematics teachers to communicate in English, and mathematics teachers being posted to areas where the teachers do not understand or speak the language of the learners. As will be discussed in the next section, it is observed that the mathematics teacher educators seem to struggle to find solutions to these challenges.

Extract 7.13 to extract 7.15 are three texts in which three of the mathematics teacher educators explained the language problems that exist in multilingual classrooms.

Extract 7.13

Mr Otani: *ah, one is failure to communicate in English, the other one is, I said first is failure to communicate in English, and the other one where some [of the students] will be posted to the areas where they speak other languages, like the Chewa posted to north where they speak Chitumbuka and they don't know Chitumbuka. So it's difficult for them to communicate with students.*

(Transcription, 05/02/2007)

Extract 7.14

Mr Chipasula: *yah, because Kasungu north it's Chitumbuka speaking area, so sometimes when you send Chewas there they face problems.*

Mr Chipasula: *yah, pupils, children don't understand Chichewa, so sometimes they fail to give instructions, similarly those that are coming deep north like Mzimba south, in the rural areas they also face language problems when they teach in the Kasungu south or the other areas of central region.*

(Transcription, 12/02/2007)

Extract 7.15

Mrs Joshua: *… I know when you go to Chichewa again, still because even our students they have learn it in English, now there are some terms like to put them in Chichewa a long sentence [laughing] …*

(Transcription, 08/01/2007)

From these extracts, the point that comes out clearly is that mathematics teachers face problems when they are posted to areas where the home language of the learners is not the home language of the teacher. In Malawi, teachers are posted to an area depending on whether there is a vacancy there or not. This policy does not consider whether the teacher speaks the same language as the learners in that area or not. It is thus not surprising that all the mathematics teacher educators saw the issue of posting a teacher to the area where the home language is different from his/her home language as a challenge.

The other point raised by Mrs Joshua (extract 7.15) is the issue of vocabulary. She says that "*… there are some terms to put them in Chichewa, a long sentence....",* meaning that mathematical vocabulary in local languages is not yet developed. The issue of vocabulary was also raised by other mathematics teacher educators. For example, when asked to reflect on the lesson that he taught, Mr Chipasula said that language was not a problem since the content being covered was to be taught in standard five where the LoLT is English.

Extract 7.16

Mr Chipasula: *so during that topic language was not an issue it's a topic to be covered in standard five and we use English.*

(Transcription, 12/02/2007)

This extract suggests that to him, language problems occur when the teachers are teaching in the lower classes (standard one to four) where Chichewa is being used as LoLT, implying that in lower classes, teachers have to translate the English mathematical terms into Chichewa. This process of translation is a challenge because mathematical vocabulary in local languages is not yet developed. I think the main issue

here is that if the LoLT is English, there will be no problems because there will be no need to translate mathematical words into the home language (Chichewa). This is also confirmed in extract 7.17.

Extract 7.17

Mr Chipasula: *yah, when it is a topic to be covered in standard five or above, we do not necessary consider the language problems because we do not consider how it is going to be taught in Chichewa.*

(Transcription, 12/02/2007)

Mr Chipasula explains that as long as the LoLT is English there will be no language problems because there will be no need for translation. This implies that when we talk of language problems, to Mr Chipasula, the issue is vocabulary and translation. When asked of any recommendations that he would make to overcome the language problems, Mr Chipasula mentions the English-Chichewa dictionary of mathematical terminology in extract 7.18 below.

Extract 7.18

Mr Chipasula: *yah, I think in-service training so that this problem of language, yah indeed is a challenge, we feel some students and pupils fail, they don't understand because of this language. And also I think there is need to have, should I say dictionary or what on terminology if, for example, to say 'zithu za ngodya zinayi' [Chichewa term]), and then you say what is ngodya [Chichewa term meaning "corner"] laughing*

(Transcription, 12/02/2007)

Mr Otani mentioned that the language skill that student teachers have attained in the process of learning how to teach in his classroom is the mathematical vocabulary.

Extract 7.19

Mr Otani: *yah, at the end of each lesson, students learn a language skill, for example they have accumulated vocabulary more especially on decimal like placing decimal places, moving to*

the right, according to the number of decimal places, so that's an accumulation of vocabulary in this topic

Mr Lukhere also mentioned the issue of translation of a lesson plan from English to Chichewa as a problem that teachers face. The student teachers write their lesson plans in English, and the teachers' guides are in English, but the teaching is to be done in Chichewa.

Extract 7.20

Mr Lukhere: *So this person or this teacher is supposed to know in Chichewa because when the teacher plans his lesson plan it is a must that the lesson plan must be in English. But when it comes to communication in a classroom with the pupils, it has to be in Chichewa, so it's like a teacher interprets what has been written in English into a local language,*

(Transcription, 09/01/2007)

What is clear from these texts is that these mathematics teacher educators recognise the issue of not having enough mathematical vocabulary in Chichewa as a challege. However, having mathematical vocabulary in local languages alone does not solve the challenges that mathematics teachers meet in multilingual classrooms. Even though it is important to have the mathematical dictionary in home languages, it might not be helpful in trying to solve the challenges that currently exist in multilingual classrooms. In her study, Setati (2002) observed that a multilingual learner in South Africa preferred the mathematical English word even when an equivalent home language mathematical word existed. So having a dictionary or mathematical terms in home language, although helpful, might not be a solution.

When I asked the mathematics teacher educators what they do to help the student teachers to teach in this type of environment, Mr Otani explained that they advise them to use teaching and learning resources as this would help the student teachers to explain what they are failing to explain in a learner's home language.

Extract 7.21

Mr Otani: *yah, ah we advise them mostly to use teaching and learning resources so that pupils can understand them better, sometimes you may explain using teaching and learning resources unlike just explaining to them.*

(Transcription, 05/02/2007)

In extract 7.21, Mr Otani explains that they play a role of an advisor. That is, as mathematics teacher educators, they advise the student teachers to use teaching and learning resources when they fail to use the learner's home language so that learners can understand better. The implication here is that, it is the responsibility of the student teachers to find solutions to the challenges that they will meet when they begin to teach, while the mathematics teacher educators serve as advisors. That means the responsibility of "finding the solution" is left to the student teachers.

Mr Chipasula gives a different way of how he helps his student teachers. He says that he just encourages the student teachers to learn some of the commonly used words in the learner's home language so that they (the student teachers) can give instructions and be able to control the class.

Extract 7.22

Mr Chipasula: *just encourage them to [laughing] to get used or try yah at least to learn some Chitumbuka and give some instructions where necessary in Chitumbuka*

(Transcription, 12/02/2007)

From extract 7.22, the student teachers have the responsibility of learning the local languages of the learners in their classrooms. The role of the mathematics teacher educators reflected in this extract is to "encourage" the student teachers.

Besides encouraging the student teachers to learn the learners's home language, Mr Chipasula admits that they (mathematics teacher educators) have not yet found a solution to these challenges that they think their student teachers will meet when they begin to teach.

Extract 7.23

Mr Chipasula: [*laughing] I think we have not yet found the solution to these problems, for example, when they are preparing the schemes of work or lesson plans, schemes of work are written in English, lesson plans are also written in English, teachers' guide is in English but pupils' book is written in Chichewa. In that case, I think in mathematics we still have a very big problem.*

(Transcription, 12/02/2007)

Mr Chipasula acknowledges the challenges that exist, but indicates that, as mathematics teacher educators, they do not have a solution to these problems. Because the mathematics teacher educators do not have a solution, the responsibility of finding the solutions to the challenges that exist in multilingual mathematics classroom is left to the student teachers themselves.

In this extract 7.23, Mr Chipasula also seems to blame the mathematics teacher educators and the policy makers for not finding the solution to the challenges that exist in multilingual classrooms. For example, he seems to question the idea that teachers have to write the lesson plans in English when they are going to teach in Chichewa, so what is the use of writing the lesson plan in English? Mr Chipasula tries to show that the mathematics teacher educators in a college mathematics classroom have real challenges to deal with, yet they do not have a solution at their disposal. This is further confirmed in extract 7.24.

Extract 7.24

Mr Chipasula: *yah, I think the problem that we have as mathematics teacher educators is that we only think of using English when teaching and so all our discussions are in English, and even like if you say can you please demonstrate how you can teach, sometimes we still emphasize that they should do it in English yet the lesson under discussion is going to be covered in lower classes where Chichewa will be used, so that is our main problem.*

(Transcription, 12/02/2007)

In extract 7.24, Mr Chipasula acknowledges that, as mathematics teacher educators, they have not started doing something that would help the student teachers to teach in local languages. He explains that, as mathematics teacher educators, they only think of using English and that all their discussions in their classrooms are done in English forgetting that the student teachers are going to use local languages when they begin to teach. He explains further that, if the student teachers practice the teaching in Chichewa, then that would ease the problem of translation. Mr Chipasula here indicates that practicing teaching in a home language might prepare the student teachers for teaching in multilingual classrooms. This is reflected in his statement saying that mathematics teacher educators emphasize the use of English, yet the topic under discussion is for the lower classes where Chichewa will be used. Again the responsibility is shifted to the student teachers

In another instance, Mr Otani acknowledges language as problematic in mathematics teaching and learning but he said that it was easy to deal with.

Extract 7.25

R:	*But how could you help such type of student teachers [who fail to express themselves] because the student knew the stuff, you could see that she knows the stuff but she couldn't explain.*
Mr Otani:	*ah its simple you can allow her or him to speak in the mother tongue.*

(Transcription, 05/02/2007)

What is reflected in these mathematics teacher educators' comments is that, despite broadly endorsing the use of home languages in their classrooms to meet the needs of the student teachers, they appear to feel little responsibility for assisting the student teachers on how to face the challenges that exist in multilingual classrooms.

From the discussion in this section, it is seen that mathematics teacher educators acknowledge the language challenges that student teachers may face when they begin teaching. However, they have not yet developed strategies that would prepare the student teachers for multilingual classrooms. The emphasis to have vocabulary in local

languages might not be helpful, as it may take time to develop this vocabulary. Also as already pointed out, having a mathematical dictionary alone may not be a solution to the problems that exist in multilingual classrooms. This suggests that student teachers in colleges of education in Malawi are not sufficiently prepared to face the challenges of teaching mathematics in multilingual classrooms. This is a big challenge for mathematics teacher educators.

7.5 Mathematics teacher educator's talk: Policy into Practice

Section 7. 3 highlights the role that mathematics teacher educators play in helping the student teachers to express themselves, by allowing them to use Chichewa in their college mathematics classrooms. Another reason why these mathematics teacher educators seem to mention using different languages is because they want to train the student teachers about how to implement the Language-in-Education Policy when they begin to teach. As indicated previously, the LoLT for the first four years of schooling in Malawi is the "mother" tongue language of the learners. So in a college mathematics classroom, Chichewa is sometimes used to equip the student teachers on how to implement this LiEP when they begin to teach. This section, therefore, highlights the role that mathematics teacher educators play in not only addressing the needs of the student teachers but also directly helping the student teachers with how they can implement the LiEP in primary classrooms. Furthermore, this section shows that there is no strategy that is put in place as to how the mathematics teacher educators will help the student teachers and, as a result, every mathematics teacher educator applies the LiEP as he/she sees it fit in his/her classroom.

First, I will present the mathematics teacher educators' responses indicating that they use Chichewa in their classrooms because they want to help the student teachers on how to implement the LiEP. This is evident in a number of texts from the mathematics teacher educators and the way in which the use of a different language (Chichewa) is represented. The example is presented in extract 7.26.

Extract 7.26

Mr Chipasula: *sometimes when we are discussing how to teach and the topic is from standard one, two or up to four, they also use Chichewa … because they will use Chichewa when teaching*

(Transcription, 12/02/2007)

Minutes later he said:

Mr Chipasula: *mainly we use Chichewa when we are, I think as I have already said when we are discussing something about primary school teaching yah*
R: *oh okay*
Mr Chipasula: *yah, for example we say, how can we introduce addition in standard one,*
R: *okay*
Mr Chipasula: *one can expect, express in English, but we say but you will use Chichewa when teaching, can you try to express in Chichewa*

(Transcription, 12/02/2007)

In these extracts, Mr Chipasula indicates that Chichewa is used when the content under discussion is for the first four years of schooling. One point that comes to the fore is that, when the student teachers are practising how to teach and the content that is under discussion is for lower primary schools, they use Chichewa. It is the student teachers who practice teaching in Chichewa, while the mathematics teacher educator uses English. That is, the mathematics teacher educators themselves use English while student teachers use Chichewa. The other mathematics teacher educators also explained the same thing.

Extract 7.27

Mr Otani: *they use Chichewa now, instead of English they should use Chichewa, why, because they are now going to teach in Chichewa [meaning when the content is for the lower primary school]*

(Transcription, 05/02/2007)

Mr Lukhere: *However when it comes to practising, they are supposed to, they are in a classroom situation the teacher is supposed to peer teach a certain topic that applies to maybe standard*

two or three maybe four, the normal practice is that student is supposed to use Chichewa and for purposes of peer teaching ah the same applies to teaching practice, the teaching practice which normally happens at the demonstration school, if the student teachers are teaching standard one to four has to use Chichewa and for standard five to eight it has to be English. That's all that I can say.

(Transcription, 09/01/2007)

Mrs Joshua: *yah, of course that have an effect, ah I take that into consideration especially when doing micro teaching, when doing micro teaching if they are given lower classes like standard one to four they are supposed to do that in Chichewa.*

(Transcription, 08/01/2007)

In all these extracts, the mathematics teacher educators point out that the student teachers use Chichewa when they are practising teaching and if the content under discussion is for lower primary schools. The use of Chichewa is, therefore, intended to enable the student teachers to implement the LiEP when they begin the actual teaching in various primary schools. This is not surprising as teachers are expected to comply with the Language-in-Education Policy and so it is the duty of the mathematics teacher educators to help the student teachers with how they are going to implement it. However, in these extracts, there is no mention that the mathematics teacher educators themselves use Chichewa at this particular point. This reveals that student teachers do not observe their mathematics teacher educators on how to teach in Chichewa, because the mathematics teacher educators use English. All the mathematics teacher educators were observed to use English throughout their lessons even though the content they were discussing was for the lower classes. It is only the student teachers who teach in Chichewa. This raises a question as to what the role of the mathematics teacher educators is in helping the student teachers how to implement the LiEP. Do they have to use Chichewa themselves or not?

Although the mathematics teacher educators do not teach in Chichewa, allowing the student teachers to teach in Chichewa helps them to progress to some extent. However, as the above extracts show, the mathematics teacher educators do not commit

themselves fully to the use of Chichewa because of the LiEP at tertiary education. In other words, the LoLT at tertiary education level makes the mathematics teacher educators shift the responsibility of teaching in Chichewa to the student teachers. At college level, the requirement is that English is to be used as the LoLT. At the same time, the policy does not elaborate on how the mathematics teacher educators should integrate the local language in their classes when the content under discussion is for lower primary schools. The question is: should the mathematics teacher educators use the Chichewa or not? As a result of this unanswered question, it seems that there is tension as mathematics teacher educators battle within themselves when and how to use English or Chichewa, and who should use Chichewa in their classes. Also, because of this unanswered question, mathematics teacher educators leave the responsibility of teaching in Chichewa to student teachers.

Mr Lukhere makes another point that, when the content under discussion is for the lower primary school, the mathematics teacher educators do not necessarily concentrate on using Chichewa, meaning that they do not teach in Chichewa, they teach in English as shown in extract 7.28.

Extract 7.28

> **Mr Lukhere:** *we use English, however, in circumstances where the topic under discussion it's supposed to be taught maybe in the infant, then maybe standard one to four, then we normally switch we don't necessarily concentrate on Chichewa, we teach in English, but use some of the words in Chichewa.*
>
> (Transcription, 09/01/2007)

Extract 7.28 shows that when they are discussing in their classrooms, it is English that is being used. Chichewa comes in only for specific words. So, although the content under discussion is for the lower primary school, the whole lesson is not done in Chichewa. This means that Chichewa is used only when the student teachers are practising as discussed above. Mr Lukhere also says that

Extract 7.29

Mr Lukhere: *am not strict [to say English only], ah I have cases where students have explained items in Chichewa so am not very strict, just because I know that they are not supposed to use Chichewa …. And they know that*

(Transcription, 09/01/2007)

Despite claiming not to be strict with the use of English, Mr Lukhere says "… *just because I know that they are not supposed to use Chichewa …. And they know that*." English is used in his classroom because it is the requirement of the school policy at tertiary level. In other words, it seems that the LoLT at tertiary level brings in a mismatch between what happens in the college mathematics classroom and what happens in a primary mathematics classroom. It brings conflict in a college mathematics classroom. This is also confirmed in this statement

Extract 7.30

Mr Lukhere: *I don't investigate about the language and of course sometimes, in a classroom situation where a student has not understood as long as they have …the issue that they have not understood and I feel like I should …, we do those repetitions, I do those repetitions but where necessary then I go to local language just to try … especially if that issue has something to do with the lower classes*

(Transcription, 09/01/2007)

Mr Lukhere emphasized that he uses a local language if what is being taught is for lower classes. In all the three extracts above, Mr Lukhere points out that Chichewa comes in only for specific words. Thus, student teachers practise to using both local language and English in a college mathematics classroom; however, how the local language should be practised remains problematic.

Mrs Joshua explains that, when student teachers are doing the micro teaching, whether the content is for lower or upper primary classes, student teachers are not supposed to code-switch. The reason is that the LiEP does not indicate that teachers should mix languages.

Extract 7.31

Mrs Joshua: *yes, language is a problem, because when they are using English, since English is not our mother language there are always problems, now some concepts, the way they are expressing it's not necessarily the way they are supposed to be but because ah they don't have enough vocabulary and the like yah, I know when you go to Chichewa again, still because even our students they have learn it in English, now there are some terms like to put them in Chichewa a long sentence [laughing] and when they are doing that they are supposed to use one language because when it's English they are just supposed to use English only yah, that's what we look for, that if it's standard five you are just supposed to use English if you use Chichewa and the like then ah*

R: *loose marks*

Mrs Joshua: *yah they lose marks for that and when they are doing it in lower classes it is supposed to be Chichewa only, now for them to explain it's like, so which ever [laughing], yah*

(Transcription, 08/01/2007)

In Mrs Joshua's class, student teachers are not supposed to code-switch during the micro teaching. For example she says, "… *when they are doing that they are supposed to use one language because when it's English they are just supposed to use English only yah, that's what we look for, that if it's standard five you are just supposed to use English if you use Chichewa and the like then…"* This means that when student teachers are teaching in Chichewa, they are not allowed to mix it with English. Similarly, if the student teachers are teaching in English, they are not supposed to mix it with Chichewa or any local language because it is against the LiEP. When I observed her class, it was indeed seen that no code-switching was observed when the student teachers were teaching. However, as discussed in chapter 5, in Malawian primary classrooms, code-switching is done by teachers. In theory, English is the only language to be spoken in the classrooms from standard five; however, in practice, other local languages are still spoken in many classrooms in and above standard five. Also, as noted before, code-switching is and will remain a common phenomenon in multilingual classrooms, especially when teachers and learners speak the same language. Therefore, the language practices in college mathematics classrooms do not reflect the practices of code-switching in primary classrooms. The mathematics teacher educators seem to comply

very strictly with the LiEP. For example, Mrs Joshua admits above that the use of English is problematic in her classroom, yet she does not allow code-switching just because it is the requirement in the LiEP. However, the teachers in primary schools do not necessarily comply with the LiEP.

While all the mathematics teacher educators explained that using a local language is important, the implementation of this remains problematic. At one level, student teachers are not allowed to use their local language as this is seen as violating the official policy; while on the other hand, the official language is not the home, first or main language of both mathematics teacher educators and student teachers. Obviously, being able to understand what the mathematics teacher educators are teaching and being able to express oneself is important for all the student teachers. An interesting question is whether the mathematics teacher educators' concern with following or using the official language is exaggerated in a multilingual setting.

This information highlights the conflict that Mrs Joshua and the other mathematics teacher educators experience when they are teaching in their classrooms. It seems that there is no strategy to help the student teachers to implement the LiEP in lower classes; as a result, every mathematics teacher educator does it in a way that he or she sees fit. These mathematics teacher educators are supportive of the ideology of using home languages in primary schools, but making it work in practice at college level where the LoLT is English only seems very challenging.

Therefore, it can be argued that student teachers, just as in other countries such as Burkina Faso, Ethiopia, and Niger, (Brock-Utne & Alidou, 2005; Chekaroua, 2004; Mekonnen, 2005) are somehow familiarized with the official LoLT required for the schools, and that they receive some pedagogical support from their teacher educators. However, the question is whether this support is enough, considering the huge challenges that mathematics teachers face as they teach mathematics in multilingual classrooms.

These mathematics teacher educators also highlight the fact that they are not able to train these student teachers for multilingual classrooms because they were not trained to

train the student teachers who are going to teach in multilingual classrooms. This is shown in extract 7.32 and extract 7.33.

Extract 7.32

Mrs Joshua: *yah, of course there are challenges, ah especially in my case, mainly I prepare those ah learners to speak in English. I don't look much at like Chichewa so that's the main challenge and I feel it could be good if we had an inset or yah something like an inset or a workshop in which we, I think not only in mathematics but even in other learning areas we can have at least a workshop so that we know these things and because we also just discover them by just reading in the books and the like but otherwise we have never learnt about that so we just teaching from the air [laughing], yah so that's the main challenge yah, because am not conversant as well with ...*

(Transcription, 08/01/2007)

Minutes later she said:

Extract 7.33

Mrs Joshua: *I think it should start with ourselves, ah we should be more trained, we should be more conversant with ah teaching especially Chichewa, because we have been trained just teaching in English and even the, the, the vocabulary some technical words which we use are just, like equations it's just English [speaking and laughing at the same time] but now to translate that to Chichewa, it becomes difficult so I still feel if we could have whether an inset or a workshop on which we ourselves should be equipped with that then after gaining that experience we can impart to the students, but at the same time I still feel just to … Chichewa, for the learners that is, I think still it's not enough, because there are some areas I tell you like the Chitipa there, Chichewa its like English, it is just as good as English no difference [laughing],*

(Transcription, 08/01/2007)

Mrs Joshua appears to be deeply agitated and frustrated with the issue of language. This is evident in her remark about how she feels about her failure to express herself in the other languages that exist in her class. She is experiencing "*painful un-clarity*" and the

situation in which she finds herself is complex. The major challenge that she has is that Chichewa to her is as hard as English.

Besides that, Mrs Joshua identifies her lack of training as the other contributing factor to her failure to meet the needs of the student teachers. Appropriate training or the lack thereof, lies at the heart of Mrs Joshua problem. All mathematics teacher educators in this study had not been trained as trainers of primary school teachers and in linguistically and culturally diverse classrooms. Mr Otani and Mr Chipasula, from Kasungu and Dowa respectively, are of Chewa origin, while Mrs Joshua and Mr Lukhere are from the Northern region of Malawi and of Chitumbuka origin. Mr Otani was trained as a primary school teacher and later upgraded to be a secondary school teacher. The other three mathematics teacher educators were trained as secondary school mathematics teachers. All of them concede that their training had not prepared them for training primary teachers and in linguistically diverse classrooms. Fraser (1992) asserts that there is need to prepare teachers for diversity in the classroom.

On the other hand, Mr Lukhere offers a different view that, as of now, mathematics teacher educators do not necessarily need training at all, as the policy, according to him, is not yet a long term as it is still on trial. Training, according to him, will be needed if the use of mother tongue is extended to include all the upper primary classrooms.

Extract 7.34

Mr Lukhere: [*laughing], ummhu, ah am not to believe that lower classes where Chichewa or the local languages have been practised, or have been used in teaching it's not yet a long term issue. I think it is still in the, should we say, ah I don't know, should I say it's going to be there for good or it's just going to be there for just quite some time and depending on whatever the ministry says it's going to be extended to other classes, ah something like up to standard eight, am not very sure because I remember a long time ago all the books were in English, the standard one books and two were in English, now of it occurs that maybe local language, the use of local language is going to be extended up to upper classes then definitely there is need even for mathematics teacher educators to be equipped in those areas and it's not only that it means there is need for, there is need for the ministry to*

> *produce books in various languages and the need for teachers to be trained using those various languages which is going to be very, very costly for the government so that's what I would say.*
>
> (Transcription, 09/01/2007)

This serves to confirm that, even though Mr Lukhere sometimes uses Chichewa in his classroom, he seems not to uphold the use of home or local languages in the college mathematics classroom. This reflects that even mathematics teacher educators themselves are divided on whether they need to be trained or not. I am highlighting this division because it raises the question of how mathematics teacher educators can focus on the way forward as to what should happen in teacher training programme. Do they have to use home languages as they train the student teachers or should they wait until the time when the upper primary classes start to use home languages as well?

The relationship between classroom practices and language policy is not a simple and straightforward one. It is extremely complex. The findings here reflect that there appears to be little recognition on the part of policy makers about the relationship between language policy and classroom practice, more especially in teacher training colleges. Merrit, Cleghorn, Abagi & Bunji (1992) have argued that issues of language choice in the classroom are much more complex than can be legislated for by policy makers; therefore, the policy makers need to consider how language is used in the classroom in order to facilitate teachers to 'more accurately identify communicative strategies for educational effectiveness' (p.105).

7.6 Conclusion

The information obtained from the mathematics teacher educators reveals a wide variety of meanings that the mathematics teacher educators assign to the multilingual classroom. Since no explanation of the term "multilingual classroom" was given to them in the interviews, it is reasonable to say that what the mathematics teacher educators gave as their understanding of multilingual classroom was what came into their minds when faced with the question. However, they were briefed about the project and what I wanted to find out from them. Therefore, some context of multilingual

classrooms was present. As such it is reasonable to say that represented here are the mathematics teacher educators' possible understandings of a multilingual classroom and the language challenges that they know as regards to teaching mathematics in multilingual classrooms.

An important point to mention about the themes that have been discussed in this chapter is that mathematics teacher educators associate multilingualism with student teachers not being able to express themselves in English. Moreover, multilingualism and code-switching, although used to help the student teachers express themselves, are seen as a problem. This is, however, problematic in the sense that, when these student teachers begin to teach, they will in one way or another code-switch in their classrooms as code-switching in multilingual classrooms cannot be avoided. As discussed in chapter 3, code-switching can pose a huge challenge to teachers and so needs to be taken seriously. With little space for code-switching in teacher training colleges, does this have an effect on the student teachers' language practices? If code-switching is to be considered as a teaching methodology, then teacher training colleges need to recognize multilingualism not as a problem, but recognize that code-switching can be developed into a teaching methodology as well.

The other point that comes out in this chapter is that the issue of code-switching is a huge challenge in teacher training programmes as it contradicts the LiEP. Unlike in primary or secondary schools, student teachers are not free to code-switch in particular in the public domain because the LoLT does not allow them to do so. Also in primary school, teachers do not strictly comply with the LiEP. Yet, it has been observed that mathematics teacher educators observe strictly the LiEP. As a result, student teachers have to be given permission to switch. If permission is not given, then code-switching is not done. Thus, I argue that if the mathematics teacher educators are to integrate home languages and English in their mathematics lessons, the implementation of policy at tertiary level has to be flexible, allowing them to use home languages in their classrooms.

Furthermore, there is a need for the mathematics teacher educators to find strategies of how to train the student teachers for multilingual classroom and be able to face the challenges that exist in mathematics multilingual classrooms. A concern here is that the challenges that exist in multilingual classrooms cannot be wished away. Yet currently training student teachers for multilingual classroom is not addressed fully in teacher training programmes. Language challenges should not be overlooked, as recognising them will allow mathematics teacher educators to develop strategies to manage or overcome them.

The next chapter shifts abit towards exploring the discourse practices commonly used in a college mathematics classroom. More particularly, it attempts to answer the following question: What are the mathematics teacher educators' discourse practices in a college mathematics classroom?

CHAPTER EIGHT

ANALYSIS OF COLLEGE MATHEMATICS CLASSROOM DISCOURSE

8.1 Introduction

In the last chapter, I focused on the mathematics teacher educators' discourses about a multilingual classroom. I discussed that multilingualism and code-switching is seen as a problem in a college mathematics classroom. It was also found that code-switching was not the main language practice in the college mathematics classrooms. Furthermore, the mismatch in the LoLT between schools and colleges brings in confusion and dilemmas in terms of which language to use when preparing the student teachers who are going to teach mathematics in language(s) other than English. Thus, I argued that mathematics teacher educators need to view multilingualism and code-switching in a positive sense in mathematics teacher education and that if the mathematics teacher educators are to consider the use of home language(s) in their classrooms, then the implementation of the Language-in-Education Policy also has to be flexible, giving the mathematics teacher educators space to use home languages in their classrooms.

The aim of this chapter is to explore the discourse practices that are commonly used by the mathematics teacher educators in a college mathematics classroom. In chapter 3, it was found that the most common discourse practice in multilingual mathematics classrooms is the use of IRE where the oral communication tends to be strictly controlled by the teachers (Burton, 1992; Chick, 1996; Colleman, 1996; Polaki, 1996; Prophet & Rowell, 1993). Also, the most familiar situation in a mathematics classroom is that of IRE (Pimm, 1987). The literature reflects that, there is a heavy reliance upon the IRE discourse practice that focuses on procedural discourse. Thus in chapter 3, I posed a question saying, what forms of classroom discourse practices in a college mathematics classroom would help the mathematics teachers to develop strategies other than the IRE in a multilingual mathematics classroom. The aim of this chapter is not to show the discourse practices that would help the mathematics teachers develop

strategies other than the IRE. Rather, this chapter discusses forms of discourse practices that are commonly used in a college mathematics classroom, with the aim of illuminating the discourse practices that student teachers are exposed to during teacher training programmes. This illumination will help to see what is and what is not in teacher training colleges in terms of training the student teachers to teach mathematics in multilingual classrooms.

In the rest of this chapter, therefore, I present a discussion about the discourse practices produced in a college mathematics classroom, and further showing how mathematics teacher educators model discourse for school mathematics teaching. Applying level 1 and 2 of analysis as described in chapter 6, I found that there were three common discourse practices that were displayed which are IRE (Pimm, 1987), traditional lecturing and group discussions. I also found that the IRE and traditional lecturing discourse practices went together with directive discourses for procedural control. (Directive discourse is a term that I have chosen to describe the pattern of discourse in this chapter and it will be explained later in section 8.2). Furthermore, I found that the procedural discourse was the prevalent discourse in all the discourse practices produced. I also observed that some of the discourse practices displayed mutually reinforces the discourses that the mathematics teacher educators display for school mathematics teaching in a multilingual mathematics classroom. For example, the mathematics teacher educators mostly displayed the IRE discourse practice for school mathematics teaching that went together with procedural discourse.

Next, I present the three general themes that came from the data analyzed which are:

- Directive discourse for procedural control in the IRE discourse practice
- Directive discourse for procedural control in the traditional discourse practice
- Procedural discourse in the group discussions.

These themes will be illuminated through a critical analysis based on different parts of lessons in different mathematics teacher educators' classrooms.

Before discussing these findings, I first discuss briefly how the analysis of this chapter is framed.

8.2 Framing the analysis: Directive discourse for procedural control

Directive discourse in this chapter refers to the way mathematics teacher educators project their will on the student teachers. According to Cazden (1986), teachers traditionally use directives as a form of "control talk" achieving procedural purposes. Through the use of directives, one is able to find out the asymmetrical power relations that exist between teachers and learners in the classroom as they are usually realized as imperatives in linguistic form by the teachers. However, there are different forms of directives for different pedagogical approaches. For example, forms of directives such as declaratives, 'I would like you to ….' and interrogatives, 'can you do ….' are commonly employed in a student-centered pedagogical approach (Luk & Lin, 2006). Fairclough (1995) terms these variations as the "democratization of discourse" (p. 79) that refers to the "reduction of overt marker of power between people of unequal institutional power – teachers and students" (p. 79).

In this chapter, using Luk & Lin's (2006) framework given in table 8.1 below, I illustrate how the mathematics teacher educators used a variety of linguistic acts for directing and controlling purposes in their classrooms, ranging from least to most direct and authoritative.

Table 8.1: Directives with varying degrees of authoritative (Luk & Lin, 2006)

Most direct and authoritative least directive and authoritative	1. Strong command, for example, hands up, shut up, listen,
	2. Shushing for example, shh
	3. Direct imperatives e.g. take out your books
	4. Polite imperatives e.g. take out your books please
	5. Declaratives e.g. I'd like/want to have three volunteers
	6. Teacher-Inclusive imperatives as suggestion e.g. Let us write it on the board
	7. Interrogatives as requests. E.g. Can you move forward
	8. Interrogatives as suggestions e.g. Shall we do this exercise now?
	9. Interrogatives as invitations e.g. Would like to try the next one?

8.3 Illustrating the directive discourse for procedural control in the IRE discourse practice

Initiation-response-evaluation (IRE) is one of the discourse practices commonly employed in multilingual mathematics classrooms (Burton, 1992; Chick, 1996; Colleman, 1996; Polaki, 1996; Prophet & Rowell, 1993). It is a traditional pattern of discourse such that the teacher asks a question, the learner answers and the teacher evaluates. The teacher continues to ask another question and so the sequence continues. In this type of discourse practice the learners' responses are usually brief, where the main concern is to provide the answer that is expected by the teacher. The teacher's role is to ask questions in order to pursue the desired answer and in most cases only a few learners are actively involved.

Using level 1 and 2 of CDA as explained in chapter 6, sections 6.3.1 and 6.3.2, the data analyzed in this study indicates that the IRE form of discourse practice is mostly used by the mathematics teacher educators in a college mathematics classroom. For example, in Mr Otani's classrooms, most interactions were initiated by him either through questions or instructions. The mathematics teacher educator initiated, the student teachers responded and this was followed by an acceptance from the mathematics teacher educator. Thus, it is an IRE interaction. This form of interaction is reflected in extract 8.1. In this extract, Mr Otani announced that they are going to use the place value chart to teach addition of fractions. He wrote an example on the chalk board and wanted to use this example to demonstrate to the student teachers how to teach additions of fractions using the place value chart. He told the student teachers that, as a first step, they needed to draw the place value chart and then indicate the place values on that chart.

Extract 8.1

Mr Otani:	*All right, let us use this place value chart to teach addition of fractions, let us say we have this one, ah one point zero seven plus zero point six two. We want to use place value chart, how can we use place value chart? First you should write the place value that is on top, okay!*
Ss:	*yes*
Mr Otani:	*then tens, then hundreds, then from one going this side!*
Ss:	*tenth*
Mr Otani:	*tenth, aha!*
Ss:	*hundredth*
Mr Otani:	*hundredth aha!*
Ss:	*thousandth*
Mr Otani:	*thousandth, now after having, after writing the heading what you should do is to model those numbers, can use counters, using real objects tikugwirizana [do we agree]!*
Ss:	*yes*
Mr Otani:	*aha, so let us model one point zero seven, here under the ones you put how many counters!*
Ss:	*one*
Mr Otani:	*you put a single counter, one then under the tenth!*
Ss:	*zero*
Mr Otani:	*aah, you put zero!*
Ss:	*counters*

Mr Otani:	*[laughing], okay just leave it as it is, eti under the hundredth!*
Ss:	*seven*
Mr Otani:	*seven counters, one, two, three, four, five, six, seven! So that is one point zero seven, so here you indicate that this one is zero point what!*
Mr Otani & *Ss:*	*seven*
Mr Otani:	*after that, write your plus sign, then you model now zero point six two, how many counters under ones!*
Ss:	*nothing*
Mr Otani:	*okay, what about tenths!*
Ss:	*six*
Mr Otani:	*six counters, one, two, three, four, five, six how many counters under tens, oh under hundredth!*
Ss:	*two*
Mr Otani:	*two, so one, two then here you indicate that this is zero point!*
Mr Otani & Ss*:*	*six, two*
Mr Otani:	*now let us add, let us add, we need to count the number of counters here, counters for here and here, so let us count*
Mr Otani & Ss:	*one*
Ss:	*two, three, four, five, six, seven. Eight, nine*
Mr Otani:	*how many counters!*
Ss:	*nine*
Mr Otani:	*nine, then you write here, one, two, three, four, five, six, seven, eight, nine here, how many counters!*

In this extract, there are a number of interactive structures that show the domination of the mathematics teacher educator in the turn-takings. Firstly, the interaction is organized according to the mathematics teacher educator's initiated moves followed by student teachers' chorused responses and mathematics teacher educator's acceptance. Student teachers were allowed to give brief answers as a class, of which Mr Otani would repeat, giving the student teachers a confirmation that their answer is correct.

Secondly, the mathematics teacher educator controls the moves/step selection in discussion. This takes place when the next step is proposed as a result of the mathematics teacher educator's accepting the student teachers' response. Thirdly there is a prominent use of closed questions indicated with a high pitch such as "*it is what!*", or "*how many here!*" which do not require responses that provide opinions or the type of answers that require thinking. As a result, student teachers are not given an

opportunity to speak more or express their opinions because the response to be given is limited. Thus, the mathematics teacher educator controls the discourse.

In extract 8.1, this type of discourse practice is seen to go with a range of directives. Firstly, he uses the teacher-inclusive imperatives such as "*… let us use…." "…let us say…" "…let us model…" "…let us add…"* and *"let us count."* He is also seen to use direct imperatives for procedural control. For example "*…first you should write…", "…you put a single counter…", "…now convert…." "…then write nine…" "….write your plus sign…""…you indicate…" and "… you model now…*" All this reveals the mathematics teacher educator's expectation of absolute observance of his instructions from the student teachers. Thus, the extract reveals the directive discourse that ensures control over the student teachers' participation.

A similar pattern was repeated in other exchanges in different classrooms as well. For example, Mrs Joshua expressed similar teacher-inclusive imperatives in an IRE discourse practice even though she tried to be democratic in her use of directives with the student teachers. In a way, Mrs Joshua indirectly is in control of the class and controls the discourse as well. For example see extract 8.2. In this lesson, Mrs Joshua was trying to teach the student teachers how to teach the naming and writing of fractions.

Extract 8.2

Mrs Joshua:	*okay, so let's move on to naming and writing fractions [distributing pieces of paper to the groups], ok can we cut our piece of paper into two equal parts, two equal parts? [Students cutting in their groups] Can one member from the group pick one piece of ah paper, one piece of paper, ok so you have [writes], one, one piece of paper out of how many!*
Ss:	*two*
Mrs Joshua:	*out of two, eti [not so!]!*
Ss:	*yes*
Mrs Joshua:	*you have had two pieces, so you have picked!*
Ss:	*one*
Mrs Joshua:	*so you have [writing], one piece of paper out of! Two pieces, okay, and that piece of paper because, previously had one complete thing and now have part of it, that means that one piece which you have picked is!*

Mrs Joshua & Ss: *a fraction*

Mrs Joshua: *okay, now how do you write that, that one piece of paper you …. It is one out of how many which you have! [writing one over two]*

Ss: *two*

Mrs Joshua: *okay, that's one piece; one part which you have, which you have is one out of! Two pieces of paper which you have, okay!*

Ss: *yes*

Mrs Joshua: *and its written as one bar down there two, okay so this is giving us ah [writing] number, in this case we have number of pieces of paper, number of pieces of paper picked [referring to one on top of two] over what!*

S13: *total number*

Mrs Joshua: *total number of pieces [writes referring to two down], are we together?*

Ss: *yes*

Extract 8.2 illustrates the IRE interaction in Mrs Joshua's class, where the mathematics teacher educator asks a question, student teachers respond in a chorus form and then she evaluates. She is seen to use closed questions marked with the use of high pitch that do not require student teachers to provide opinions or the type of answers that require thinking. Student teachers were allowed to give brief answers as a class. There is also prominent mathematics teacher educator talk. She talks much more than the student teachers and so she controls the discourse.

In this extract, Mrs Joshua also uses teacher-inclusive imperatives at the beginning when she was trying to explain what they are going to do in their class. For example, she uses words such as "*let's move on*", "*can we cut our piece of paper into two equal parts*", and "*can one member from the group pick one piece of ah paper.*" This reveals Mrs Joshua's expectation for observance of her instructions and control over the procedure.

Another interesting feature in this extract is where Mrs Joshua herself answered the questions that she asked. For example she said, "*so you have [writing], one piece of paper out of! Two pieces,*" in her first turn "*okay, now how do you write that, that one piece of paper you …. It is one out of how many which you have*", in her ninth turn and "*okay, that's one piece; one part which you have which you have is one out of! Two*

pieces of paper which you have" in her 11th turn. Mrs Joshua did not provide time for the student teachers to offer their own answers. In other words, the mathematics teacher educator denied the opportunity for the student teachers to be active and participate in the discourse.

Mr Otani also showed the same IRE pattern in a different class as seen in extract 8.3.

Extract 8.3

Mr Otani:	*Yesterday we were discussing how you can convert common fractions into decimal fractions and decimal fractions into common fractions. Let's say we have a fraction like half, how can you convert that fraction into a decimal fraction? [Pause], yes?*
S1:	*By dividing the numerator by the denominator.*
Mr Otani:	*By dividing the numerator by the!*
Ss:	*denominator*
Mr Otani:	*divide the numerator by the denominator, so it's like here, two into one!*
Ss:	*Zero*
Mr Otani:	*Zero, [writing on the chalk board], aha, after writing zero you put what!*
Ss:	*decimal point*
Mr Otani:	*[writing on the chalk board the decimal point], right, aha, after that!*
Ss:	*add a zero*
Mr Otani:	*so here we write zero*
Ss:	*yes*
Mr Otani:	*then two into ten!*
Ss:	*five*
Mr Otani:	*[writing on the board five], therefore half is equivalent to!*
Ss:	*zero point five*
Mr Otani:	*okay, what about one over one thousand, [silence], one over one thousand, let us convert that one into decimal places, [Silence], yes*

In this extract, Mr Otani controls the selection of steps and there is a presence of prominent mathematics teacher educator talk as well. Besides that, there are teacher-inclusive imperatives and direct imperatives that have been used such as "*divide the numerator…" "…after writing zero you put…" "we write zero…"* and "*let us convert that…"* This reflects the existence of control or domination in turn-taking. This

confirms that the mathematics teacher educator controls and dominates the flow of the discourse.

In general, in all these examples, moves were initiated by the mathematics teacher educators followed by the student teachers' responses and then acknowledgement by the mathematics teacher educators, confirming the findings of other researchers that the IRE discourse practice that goes together with the directive discourse is also common in a college mathematics classroom. In the analysis of classroom discourse, studies reveal that this specific discourse practice is normally found in institutions that involve the "professional" and the "public" or "teacher" and the "student" (Fairclough, 1992, p. 153). In this case the mathematics teacher educator dominates the turn-taking.

Such type of discourse practice leads to teacher control of the basic organization of interaction by opening as well as closing every move. This reflects the existence of control in turn-taking where student teachers are not often given a chance of getting a turn to speak unless given by the mathematics teacher educator through the given questions. In one aspect, this turn-taking system is one method of controlling the flow of discourse and at the same time reflects mathematics teacher educator domination.

This IRE discourse practice excludes a number of other possibilities, including student teachers practicing the discourse that can be developed and encouraged for mathematics teaching. So, for example, in these extracts no sentences were produced by the student teachers; no chance was given to them to explain how they would teach this type of example. Even though phrases such as "… *let us use…*", "… *we have this one…*" and "… *we want this*…" were used, in the process it was actually the mathematics teacher educators who were doing most of the things.

Directive discourse for school mathematics teaching

This directive discourse was also seen when the mathematics teacher educators modeled the discourse for school mathematics teaching. For example, Mr Otani is one of the mathematics teacher educators who tried to model the student teachers' discourse for school mathematics teaching by restructuring and rephrasing the student teachers'

presentations. The analysis of this data reveals that Mr Otani modeled the student teachers' discourses into the directive discourse. Though not explicitly, the section shows that the discourse produced by the mathematics teacher educator in his mathematics classrooms is similar to the discourse that he displays for school mathematics teaching. Thus, his discourses seem to be mutually reinforcing. This is seen in extract 8.4.

In this part of the lesson, Mr Otani was responding to the student teachers' presentation on how to teach the addition of decimal numbers (0.7 and 0.2) using a number line. In response to this presentation, Mr Otani restructured the student teachers' presentation. This extract reflects how Mr Otani displays the directive discourse for mathematics teaching. Extract 8.4 presents Mr Otani's response.

Extract 8.4

Mr Otani:	*so instead of drawing a number line from here up to two here, you can just draw your number line unnhu, then here you indicate that it is zero and here is what!*
Ss:	*one*
Mr Otani:	*one, then between zero and one you mark how many points!*
Ss:	*some say nine while some say ten*
Mr Otani:	*yah, nine points, so its one, two, three, four, five, six, seven, eight, nine then this one simply means that each point is a, a fraction why, because we are, we are in the range between zero and one, which is a whole number, so you let your pupil to stand on zero and ask him or her to move how many steps!*
Ss:	*seven*
Mr Otani:	*seven steps, one, two, three up to!*
Mr Otani & Ss:	*seven*
Mr Otani:	*then ask him or her to add how many more steps!*
Ss:	*two*
Mr Otani:	*then you ask him to say the number indicated on where s/he is standing. Seven, zero point, but first of all you should discuss this one [pointing at 7 plus 2] eti, these are the things that they have done already, not so?*
Ss:	*yes*
Mr Otani:	*you are just revising then after that that's when you introduce decimal fractions, clear?*
Ss:	*yes*

In extract 8.4, Mr Otani displays an imperative directive discourse to the student teachers. For example, he says "… *you ask him or her to move …*" and "*…you ask him or her to say…*" This indicates that the teacher is to direct and the school learner to comply. In this presentation, I noticed that he used mostly the pronoun "*you*" and "*your*" indicating the role that the teacher needs to take in the process of teaching. The mathematics teacher in this case is the one who does most of the things, controls the class, has authority over the school learners, while the school learners are positioned as in need of instruction and always to be guided by the teacher.

Mr Otani's language was also procedural and provided chances for short answers only throughout. He did not encourage questions that will make the student teachers think. For example, when the student teachers gave different answers, he did not ask the student teachers why they gave different answers, he just said "*...yah, nine points...*" The student teachers also accepted it without questioning, thus assuming the role of a compliant learner. This directive discourse ensures that the teacher is always in control and has authority over his/her learners. He displays a discourse where the teacher asserts authority, putting the learners in a position of compliance. So, in general, Mr Otani and the other mathematics teacher educators displayed a discourse for school mathematics teaching that reflects their relation to the world (Johnstone, 2002) where they maintain the ideological categorization of the expert teacher over passive and compliant learners.

Similarly Mr. Lukhere was observed to display the directive discourse for school mathematics teaching in the following example.

Extract 8.5

Mr. Lukhere: *so, one that is supposed to tell the pupil is just add the numerators eh*
Ss: *yes*
Mr. Lukhere: *and maintain the*
Mr. Lukhere & *Ss:* *denominator*
Mr. Lukhere: *so this is going to be equal to one plus*
Ss: *three*
Mr. Lukhere: *over*
Ss: *five*

Mr. Lukhere: *not necessarily making divisions, so this is four over*
Mr. Lukhere & *Ss:* *five*
Mr. Lukhere: *just add the numerators, while maintaining the*
Mr. Lukhere & *Ss:* *denominators*
Mr. Lukhere: *that's addition of proper fractions whose denominators are the same. That's what you are supposed to tell your learners..…*

In extract 8.5 Mr. Lukhere says "*one is supposed to tell the pupil*" and he concludes with the same statement saying "*that is what you are supposed to tell your learners*". Explicitly, he represents teachers as the ones having all the responsibility for everything that happens in the classroom. It seems to give the impression that every learner's action, every bit of the learner's learning, every aspect of classroom activity would be under the teacher's control, so that the teacher would be accountable for every outcome. That is the directive discourse that he displays to his student teachers for school mathematics teaching. In this case the result is that the mathematics teacher educator and student teachers are affirmed and (re)constituted as such, even as the practices in which they participate disenfranchise some of the participants, and sometimes themselves. For example, the student teachers in extract 8.5 appear to concur that student teachers are generally to do what their mathematics teacher educator is telling them to do and follow the things that have been taught without asking questions. This then serves to merely validate the teacher and the continued discrimination of the actions to which s/he subscribes.

Likewise Mr. Chpasula also did the same thing as illustrated in extract 8.6.

Extract 8.6

Mr. Chipasula: *(rubbing), so I think it's just better to tell our learners that first of all we ignore the points, we take these as whole numbers, so this step will give you sixty nine times five (writing) (He tells the first step), so what should be the second step, multiply just like this one, they say forget the decimal places, then multiply the numbers, so we are treating these as whole numbers and in the prerequisite knowledge we mentioned multiplication of whole numbers so they know how to multiply,, so if we multiply sixty nine by five what do we get, you multiplied in your groups*

The emphasis in this extract is that the student teachers should tell their learners what to do, direct the steps to be followed, and school learners are expected to follow the teachers' instructions. All these words indicate the role of the mathematics teacher, where he/she is directing and controlling the whole process while retaining the passiveness of the learners. Thus, he models the student teacher discourses into the directive discourse that is required for mathematics teaching, in a way drawing the student teachers into the discourse of mathematics teaching. This may suggest that, though not explicitly, the directive discourse in mathematics teaching is an established discourse that Mr. Otani wants his student teachers to be absorbed in.

I followed up with Mr. Otani to find out why he does his teaching in this way during the reflective interviews. The four extracts below indicate what Mr. Otani said.

Extract 8.7

Mr. Otani: *ok, the aim was first to impart knowledge of how they can conduct the lesson in classrooms, after that it's when we come to the part where you can allow them to express themselves or to teach as they have been taught*

Extract 8.8

Mr. Otani: *yah, the aim is to take everyone in that class so that they should, they should learn how they could go about teaching that lesson … they should observe and do the same*

Minutes later he said

Extract 8.9

Mr. Otani: *but the main aim is, we are doing this because of two things one the at the end they have to write exams and they cannot do well if they don't do what we did in the lesson ah, secondly they should apply this knowledge wherever they will go*

Mr. Otani's words indicate that what they are doing is the right thing and student teachers have to follow that if they want to do well both during examinations and when they go for the actual teaching. The focus seems to be driven by the examination oriented syllabus and the curriculum. Furthermore he indicated that if he does not do

what he does in his classroom, the student teachers will have difficulties to have a picture of what is going on.

Extract 8.10

Mr. Otani: *ummhu it's difficult for them to have a clear picture of what is going on*

The emphasis in this case is that student teachers are then expected to do as they have been taught. In other words, they will need to demonstrate the directive discourse as they have been taught. Thus, the mathematics teacher educator's practices promote and preserve the directive discourse and wish to pass it on to the student teachers. They reflect the ideological position of teachers as directors and experts.

8.4 Illustrating the directive discourse for procedural control in a traditional lecture discourse practice

The traditional lecture discourse practice of teaching follows a distinctive lecture pattern consisting of (1) the teacher going over the previous day's homework, (2) lecturing on new topics illustrated with a few examples, and (3) devoting the remainder of the class time to independent practice (Susanka, 2006). Thus a "traditional lecture discourse practice" in the mathematics classroom is a means by which "the expert" (in this case the teacher educator) presents the material of the course in an organized way to "the learners" (in this case the student teachers), going from theory to examples and back again.

One of the factors that work to maintain the traditional lecture discourse practice is rooted in teachers' views of mathematics and of how learners learn it. For example, the sequence of classroom activities such as the teacher going over the previous day's homework, lecturing on new topics illustrated with a few examples, and devoting the remainder of the class time to independent practice, is consistent with a perspective that the role of the teacher is to demonstrate, explain, and define the material, presenting it in an expository style (Kuhs & Ball, 1986). Accordingly, the role of the learners is to "listen, participate in didactic interactions (for example, responding to teacher

questions) and do exercises or problems using procedures that have been modeled by the teacher or text" (Kuhs & Ball, 1986, p.23). Thus the teacher is reflected as an expert.

The other perspective claims "that mathematics is a useful but unrelated collection of facts, rules and skills," and the view that mathematics is a "unified body of knowledge, consisting of interconnecting structures and truths" (Ernest, 1989, p 21). These views suggest that traditional mathematics teaching consists mainly of the teacher transferring facts, rules, and mathematical truths to the learners, who are viewed as passive recipients of knowledge, "empty vessels" to be filled with the prescribed curriculum (Ernest, 1991). The learners in this case typically listen, watch what the teacher does and then take notes and try to pick up as many ideas and insights as they can from the expert during those class hours when the method is in use. Also, as time allows, learners ask questions for the expert to clarify and extend points or examples and clear up confusion or possible errors. According to Ernest (1991), this discourse of teaching will persist until teachers become aware of alternative views of the nature of mathematics, reflect on their established views, and take active steps to understand and accept the alternatives.

Among the four mathematics teacher educators involved in this study, Mr Lukhere seems to be the only one who has been observed to employ this type of discourse practice in his lessons. The data analyzed reveal that Mr Lukhere presented the material as student teachers listen, watch and take notes. This structure is seen in extract 8.11 below, where Mr Lukhere and his student teachers were discussing how to model the addition of fractions whose denominators are the same. Mr Lukhere uses charts to enable him to explain the process of modeling and at the same time enabling the student teachers to see clearly how to add the fractions that have the same denominators. Mr Lukhere read aloud the steps involved from the chart and expanded more where he deemed necessary to do so. In extract 8.11, I illustrate the discourse that Mr Lukhere commonly employed in his mathematics classroom and how he displayed it to the student teachers.

Extract 8.11

Mr Lukhere's presentation

Mr Lukhere: *[Hanging a chart on top of the chalkboard], okay, addition of proper fractions whose denominators are the same, addition of proper fractions whose denominators are the same, [reading from the char]) consider the following addition problem that is, one plus, one over five plus three over five [reading from the chart], model the addition process as follows, that is to say when we are trying to teach addition of fractions, we normally start with simpler things which pupils can appreciate, that is, they can easily see, that is why there is need for us to model the addition of these fractions, and to do that we are going to use a rectangle with eh some subdivisions, and for this sum of one over five plus three over five, first of all there is need for us to model the addition process as follows, draw a rectangle as I have done this one [pointing to the rectangle], it has to be a rectangle or a circle, divide that rectangle into ah five equal parts as shown below, by dividing this rectangle into five equal parts, because of the denominator, that we are using in this addition then model the fractions one fifth and three fifth, how have we modeled the fractions in this case, I have modeled one fifth by shading this different from ah three fifth which is these three parts and then out of the five parts, one part has been modeled as one fifth, which is this one, three parts has been modeled which represent that fraction [pointing to three fifth] and then when we add the total number of parts which have been shaded we end up with one, two, three, four out of how many parts!*

Ss: *five*

Mr Lukhere: *five, so that's the way we can model the addition of fractions whose denominators are the same,*

During this part of the lesson, the hanging of the chart demonstrates a number of points about presenting and displaying the discourse for mathematics teaching. To begin with, it is clear that the chart will play a central position in the demonstration. Secondly, the mathematics teacher educator's choice of the major steps to be included on the chart provides a statement about the necessary steps to be used in modeling the addition of fractions with the same denominators. The hanging of the chart is also significant as it provides a visual part of the demonstration to the student teachers about the resources

and procedure that will be used in this part of the lesson. Thus the chart was used as a way of transmitting the discourse to the student teachers in this lesson.

In extract 8.11, Mr Lukhere demonstrated and explained, using an example how to model the addition of fractions that have the same denominator. It is seen from this extract that there were no interruptions as the mathematics teacher educator was demonstrating. The student teachers were seen to listen, watch and take notes quietly. Thus, Mr Lukhere reflected a traditional lecture discourse practice in his classroom. Later, as will be seen in this section, after his demonstrations, student teachers were given an exercise on the chalk board to be solved individually.

Mr Lukhere also through his language indicates that there is a traditional type of discourse for school mathematics teaching. Mr Lukhere notes, for example, that as mathematics teachers "… *when we are trying to teach addition of fractions, we normally start with simpler things which pupils can appreciate, that is, they can easily see that is why there is need for us to model the addition of these fractions*". There is a sense in which these words reflect a traditional type of discourse to mathematics teaching practice – namely a discourse which is established and inflexible as a way of teaching mathematics in that one usage of "*we normally start with*".

In this discourse practice, Mr Lukhere uses direct imperatives such as "*model the addition process as follows...*"; "*draw a rectangle as I have done this one...*" ; "*it has to be a rectangle or a circle"; "divide into five equal parts as shown below"* and "*that's the way we can model."* These are phrases which assume unquestioning student teacher compliance with the steps of how to teach mathematics. His use of "we" indicates the voice of authority. Also throughout the extract, there were no questions posed to the student teachers, only statements indicating his authority. The student teachers at this time needed to be listening and watching what the mathematics teacher educator was doing. Furthermore, throughout this extract, Mr Lukhere used statements rather than questions, implying that what he was saying is rather a command than a suggestion. This is further confirmed when he concluded his presentation with another statement that says "*that's the way we can ...*" The extract, therefore, reflects the professional as

expert perspective embedded (Fairclough, 1995 p.15) in the discursive practices of the mathematics teaching. It also reflects the unquestioned student teachers compliance.

This traditional lecture discourse practice is also illustrated in the extract 8.12.

Extract 8.12

Mr Lukhere: *so that's okay, ummhu, that's what is supposed to happen, ah in other words, the simplest way to identify the numbers to multiply with is, for the first fraction multiply with the denominator of the second fraction, and then for the second fraction multiply with the denominator of the first fraction, so you must be able to find four over twelve and three over twelve, next replace the original one third by four over twelve and one quarter, this one by three over twelve in the addition problem, and this is what is supposed to look like, in this case we have the same denominator as was the case with the addition of proper fractions with the same denominator, example we have just discussed, so next thing is for us or for you with your pupils to add the numerators and maintain the denominators to arrive at the answer as follows, that is four over twelve plus three over twelve to have four plus three over twelve to get seven over twelve, that's how you are supposed to add addition of proper fractions whose denominators are not the same [refers to his notes] …. Which I think involves a bit of calculations, where to use LCM, that is lowest common multiple,*

In this extract, Mr Lukhere used the lecture discourse practice to show the student teachers how to add fractions with different denominators. He presented the material without interventions or interruptions from the student teachers. Student teachers were listening and copying notes as he demonstrated. Thus again he reflected the traditional lecture discourse practice, where teachers are seen as experts over their learners.

It is also noted that, in his language, the prominent textual features include the use of both direct imperatives and strong commands. For example he uses "*you must be able to …", "next replace…", "this is what is supposed to look like," "next thing is for us or for you with your pupils to add … as follows"* and "*that's how you are supposed to add…"* This requires student teachers to follow directions as prescribed by the mathematics teacher educator, to accept the material as it is. Student teachers here are

positioned as passive recipients who are active only when they are asked to do exercise individually.

In compliance with the lecture discourse practice, at the end of his demonstration in his class, Mr Lukhere required the student teachers to do the exercise on the chalkboard individually and they were supposed to reproduce what they had been taught. For example, Mr Lukhere said that:

Extract 8.13

Mr Lukhere: *using the same procedure for modeling addition of fractions, may I have one volunteer to model the addition of four seventh plus two seventh [writing on the board, model using the number line the following 4 over seven plus two over seven] for those two fractions, ladies I can't see you, are you here, ahh may I have one volunteer*

In another class he said:

Extract 8.14

Mr Lukhere: *using the same example, may I have a volunteer, once again to demonstrate to us how to add [writing one third plus one quarter] the two numbers using lowest common multiple of the two denominators of the fractions, yes,*

Mr Lukhere emphasized here and directed the student teachers that they should "*use the same procedure*" that he demonstrated when he was teaching them how to teach addition of fractions followed by a polite imperative "*may I have one volunteer*". This was used as a way of evaluating if the student teachers had understood the mathematics teacher educator's presentation. Below, I illustrate one student teacher's presentation.

Extract 8.15

Student teachers' presentation:

S7: [*drawing a circle, dividing into seven parts], first we are going to draw a circle, then we divide it into seven parts, after that we shade four parts [shading the four parts] and this part represents four over seven [writing as she speaks], then we shade two other parts [shading two], and these two parts represent two over seven [writing while speaking],*

	after that we are going to count from all, we are going to count all parts that we have shade, one, two, three, four, five, six, that means [writing equal to sign], two over seven plus four over seven is equal to six over seven [writing six over seven] that's all
Mr Lukhere:	*any observations, one with the circle*
Ss:	*[not clear]*
Mr Lukhere:	*what!*
S2:	*the parts were not equal*
Mr Lukhere:	*the parts were not equal aha, that's true, eh some sections were bigger than others eti [not so]*
Ss:	*yes*
Mr Lukhere:	*what else do you notice, was the shading clear?*
Ss:	*yes*
Mr Lukhere:	*I mean were you able to notice the demarcations?*
Ss:	*yes*
Mr Lukhere:	*here can you notice the demarcations?*
Ss:	*[some say yes some no]*
Mr Lukhere:	*I can't see, maybe I need glasses, okay, otherwise apart from those observation, that's how we are supposed to model additions of fractions, that is whose denominators are the same*

The student teacher's demonstration in extract 8.15 very clearly is the reproduction of what Mr Lukhere did in extract 8.12. This is not surprising as in most cases; in mathematics classroom students tend to reproduce what their teacher has just taught. However, in this case, one can also assume that there is a close correspondence between what Mr Lukhere said and what the student teacher did in his presentation. For example, Mr Lukhere indicated that "*it has to be a rectangle or a circle*…" This student teacher used a circle in her modeling process. As the first step, the student teacher said "*first we are going to draw a circle*". Second step, divided the circle into seven parts. As a third step she had shaded the given fractions and then lastly add the shaded parts. These are the steps that Mr Lukhere presented in his process of modeling and the student teachers were just reproducing the discourse. Just like Mr Lukhere, the student teacher did most of the talking alone without involving the student teachers in the class or the language that reflects the involvement of learners in the lesson.

This student teacher in her language maintained the position as demonstrated by Mr Lukhere. Throughout her presentation, she used the teacher-inclusive imperatives as

suggestions, for example she used phrases '*we are going to draw*", "*then we divide it*", "*we shed four parts*" and "*we are going to count*". This reflects the directive discourse which assumes the teacher as an "expert" over his or her learners. It might be that Mr Lukhere's directive discourse affirmed to her the discourse for school mathematics teaching.

Another point to note is the conclusion made by Mr Lukhere in extract 8.15. "*Okay, apart from the observations*". He says, "*that's the way to add the fractions with the same denominators*". To him, this serves as a way of confirming the student teacher's presentation, that it is correct.

To illustrate further that what was more important was the reproduction of what has been taught, below is an example of the comments made by the mathematics teacher educator where he indicated that what has been followed in the presentation is not what he wanted.

Extract 8.16

Mr Lukhere: *anyway, he is correct but he has gone too far, that is not the one I was looking for; the issue here is the denominators are the same eh!*

In extract 8.16, Mr Lukhere indicated that what the student teacher did was correct, but that is not what he was looking for. In other words, the student teacher did not do what Mr Lukhere demonstrated in his lecture. The expectation, of Mr Lukhere, was that student teachers should be able to reproduce what their educators have done in the classroom.

An important point to mention here is that Mr Lukhere was re-creating the practices that a "society" has recognized as legitimate and so helps to create a major reference point for what is a "good" practice for mathematics teaching. In this case, the practices participate in ideological regulation. Thus the ideology that stands behind this section is a commitment to the traditional teaching of school mathematics and clear mathematics teachers' roles and values in a mathematics classroom. It appears that maintenance of ideology of culture of expertise, preservation of the high status of the mathematics

teachers' identity features highly. Thus Mr Lukhere's practices are part of a system of enforcing the expertise of the teacher.

8.5 Illustrating a procedural discourse in a group discussion(s) discourse practice

In this section, I discuss the discourse of teaching that emphasizes a group discussion discourse practice, where student teachers performance and mastery of mathematical rules and procedures is given priority. The discourse practice in this section is defined generally as a learning environment where the mathematics teacher educator guides the student teachers in the development of a mathematical procedure through the assignment of some reinforcing exercise for the student teachers to work out. The student teachers are expected to work in groups and cooperatively to come up with the procedure for school mathematics teaching. This type of discourse practice is not common in the college mathematics classrooms that I visited. The mathematics teacher educator positions himself as a facilitator as student teachers work in their groups. However, even though classroom discussions were observed, the effectiveness of the classroom discussions was doubtful because it was the mathematics teacher educator who initiated and controlled the discussion. The mathematics teacher educator defined clear content boundaries for the discussion and the discussions focussed on the discourse of procedures for school mathematics teaching.

Mr Chipasula is one of the mathematics teacher educators who used group discussions in his classroom. His student teachers were divided into small groups of six each and student teachers in each group worked together. In general, the main feature in group discussions is where learners talk about mathematics in such a way that they reveal their understanding of concepts. Learners also learn to engage in mathematical reasoning and debate. In this case, the discourse involves asking strategic questions that elicit from learners both how a problem was solved and why a particular method was chosen. Learners learn to critique their own and others' ideas and seek out efficient mathematical solutions. Paul Cobb (2006) states that there are two parts to a mathematical explanation: the calculation explanation which involves explaining how

an answer or result was arrived at – that is the process that was used; and a conceptual explanation which involves explaining why that process was selected – that is what the reasons for choosing a particular way are. In this way learners have to be able not only to perform a mathematical procedure but justify why they have used that particular procedure for a given problem.

In the data analyzed, the group discussions focused on the calculation explanation where student teachers were involved in discussing the procedure only. For example, extract 8.17 shows Mr Chipasula telling his student teachers to discuss how to multiply two decimal numbers in their groups and then come up with a general procedure for multiplying decimals. Immediately, student teachers began formulating the procedures in their groups.

Extract 8.17

Mr Chipasula: *so since we are talking of decimals and place value of decimal numbers, necessary now with this knowledge, how can we teach multiplication for the first time, so in your discussions please include rules which we follow when multiplying decimal numbers, use the following example [writing the example on the board, 6.9 × 0.005], six point nine times zero point zero, zero five, discuss steps of procedure to be followed to come up with a correct answer so those procedure will give you some general rules, lets have five minutes*

Ss: *[students discussing in their groups]*

In this extract, Mr Chipasula gave the student teachers an opportunity for group discussions in the class. It is also observed that Mr Chipasula explained to the student teachers what they were expected to discuss in their groups, that is, to come up with a procedure for multiplying decimal numbers. Thus, the group discussions here focused on developing the procedure.

Mr Chipasula, also, when giving instructions to the student teachers for the group discussions, used both direct and polite imperatives such as "*please include rules which we follow*", "*use the following example*" and "*discuss steps of procedure to be followed*." By the use of these directives, focus and direction are prescribed by the

mathematics teacher educator as on a single perspective. It has clear content boundary, that is, calculation discussions. Even though the student teachers were allowed to discuss in their groups, it is noted that the discussions were about finding the rules or procedure that can be used for teaching multiplication of decimal numbers in schools. The mathematics teacher educator positioned himself as a facilitator and the student teachers were restricted in terms of the focus of their discussions.

This observation echoes what Krashen (1982) and Long (1983) found in their studies in schools. Krashen (1982) and Long (1983) observed that even though classroom discussions were used in their study, the effectiveness of those classroom discussions was doubtful because it was the teacher who initiated what to be discussed, decides who provides a response, which the teacher either commends or condemns. Furthermore, the teacher decides when to put an end to the discussion. Therefore, the student teachers' participation in the college mathematics classroom is limited and controlled even though it is group discussion.

A similar pattern was repeated in extract 8.18, where Mr Chipasula announced to the student teachers that, in their groups, they should discuss the rules and procedure for division of decimal numbers from the given example.

Extract 8.18

Mr Chipasula: *here is an example of division of decimals, eight point one nine divide by zero point nine, use this example to come up with general rules or major steps to be used when teaching division, division of decimals, use this example so as you are solving it generate some rules or point out some main steps what you emphasize when you are teaching division of decimal, so choose one member to write for the group, who is writing here, this one, so the rest would …*

Ss: [*discussing while the mathematics teacher educators moves around checking what students are discussing]*

The main activity in this part of the lesson is for the student teachers in their groups to generate "*rules*" or "*main steps*" to be followed when doing division of decimal numbers. Again here, Mr Chipasula facilitates the discussions that focus on the procedures for school mathematics teaching. It seems that he is of the view that

suggests (school) mathematics teaching as consisting mainly of the teacher transferring facts, rules, and mathematical truths to the (school learners), who are viewed as passive recipients of knowledge (…) (Ernest, 1991). The teachers in this case are positioned as experts over passive school learners. The discourse of Mr Chipasula, therefore, restricts the student teachers to a procedural discourse. Therefore, though it is a group discussion, it has characteristics of procedural discourse.

In this extract, this structure is also seen to go with the use of direct imperatives, for example, he uses sentences such as "*use this example to come up with general rules...*", "*use this example ... generates some rules…"* and "*choose one to write…*" These directives define the focus and direction of the discussion. The use of these directives also reflects that the group discussions are controlled. So, even though Mr Chipasula positions himself as a facilitator in his class and gives the student teachers the opportunity for discussions, he still controls the type of discourse to be focused on. The direct imperatives in this case reflect the control that the mathematics teacher educator has over the discourse to be focused on in the discussion.

Another example is seen in Mrs Joshua's class where student teachers were discussing the division process of two numbers in their groups. In extract 8.19 and 8.20, I give two examples from Mrs Joshua's class.

Extract 8.19

Mrs Joshua:	*from seven over six, we are going to divide ah denominator into the numerator, and write what you begin with, can we do that in groups*
Ss:	*[students doing the division in their groups],*
Mrs Joshua:	*I hope you are through*

Extract 8.20

Mrs Joshua:	*now in our groups consider [writing on the board], consider the number two, four over five, okay, let us show two, four over five, ok let's come up with a number line, and on that number line, let us show two four over!*
Ss:	*[Students discussing in their groups]*
Mrs Joshua:	*come up with a number line, and on that number line show two over!*

Ss:	*[students discussing while the mathematics teacher educators moves around the groups],*
Mrs Joshua:	*are you through*
Ss:	*[some say yes, some no]*

The main activity in extract 8.19 is about student teachers' discussing in their groups the division process of two numbers. Similarly, in the second extract 8.20, student teachers were supposed to locate the number four over five on a number line. In both cases, student teachers engaged in mathematical procedure in their groups. The discourse involves mathematical process when solving a problem and not necessarily on reasoning questions. Student teachers learn to seek out efficient mathematical procedures in order to find a correct answer rather than a critique on their own and others' ideas. The pattern of discourse is related to the nature of mathematical explanations that focus on calculation explanation, which involves explaining how an answer or result was arrived at (Paul Cobb, 2006). In this way, student teachers are prepared to perform only a mathematical procedure without justification on why they have used that particular procedure for a given problem.

Unlike Mr Chipasula, Mrs Joshua uses mostly the teacher inclusive imperatives such as "*we are going to divide …*" in extract 8.19 and "*now in our groups consider …*" in extract 8.14. She is also seen to be using more interrogatives as suggestions for example "*…can we do that in our groups…*" in extract 8.19 and "*…let's come up with a number line … let us show two four over…*" in 8.20. She tried to be democratic. However, even though she tries to be democratic in her discourse, she indirectly controls the focus of the discourse here – the procedure.

Sometimes in Mrs Joshua's class there were discussions about how the student teachers had done the problem and the chance was also given for the student teachers to report what they had discussed to the whole class. As it will be seen in the following extract, although the chance was given for debate, suddenly the opportunity was taken away from the student teachers ending up with the mathematics teacher educator demonstrating the steps. This is seen in the following extract.

Extract 8.21

Mrs Joshua: *[moving around checking the group that is through], okay, can we have the group at the corner there, to show us the number line, how you have come up with a number line, two ah, two four over five, yes, this group, group one*

SG1: *one*

Mrs Joshua: *yes, come and show us how you have come up with two, four over five [moving the chart on the board]*

SG1: *[draws a line, demarcating into parts] from zero to three [i.e. five parts] between zero and one, one and two, two and three and indicated two four over five as fourteen over five*

Mrs Joshua: *okay, yes any group with a different number line*

SG2: *[draws a line, label from zero to two, after two demarcated to five parts to three, then indicated one over five, two over five, three over five, four over five]*

Mrs Joshua: *okay, another group with a different number line or are the same [talking to another group] okay*

SG3: *[draws their line]*

S5: *[students laughing]*

Mrs Joshua: *okay, time is not on our side from these number lines the demarcations from zero to three are the same, although they didn't use a ruler but you were supposed to use a ruler and even the distances should be the same and, when us are saying over five, that means you have five demarcations from zero to one whether ah from zero to one, you have five! Segments, okay, five segments, so that means, you should have, from here to here, these ones should be five, so as they are here, they are five, and if they are five from zero to one, that means, one part is, one segment is one over! Five of! One, okay. So here to here is four over five, okay, now up to here [that is one], this is five over!*

Ss: *five*

Mrs Joshua: *then as you proceed here and then ten over [at two]*

Ss: *five*

Mrs Joshua: *up to whatever, but as I have already said our interest is on the number line,*

In this part of the lesson, Mrs Joshua asked the student teacher representatives of each group to show on the chalk board how they had allocated the number four over five on the number line. The main feature in this extract is that the student teachers from each group were seen drawing the number lines on the chalk board and indicating the point without explaining how and why they did that. Later on, it is seen that it was actually the mathematics teacher educator who summarized how to indicate four over five on the number line. Even though the opportunity was given for class discussion and debate for

the student teachers to publicize/report their findings that chance was taken away from them. This reflects how the mathematics teacher educator controlled the discourse in her class and student teachers were denied the opportunity to discuss the discourse. Thus the teaching of mathematics in this classroom can be characterized as being procedural with little or no development of concepts. Student teachers were not given an opportunity to explain how they came up with the number on the number line. Instead the mathematics teacher educator ended up explaining to the student teachers how to come up with the solution.

With all this control, the mathematics teacher educator continued to use teacher inclusive imperatives. Although she positions herself as a facilitator, indirectly she controls the discourse and focus on the procedure.

Similarly, in Mr Chipasula's class, student teachers were asked to report on what they had discussed in their groups. It is observed that still the focus of their discussions is on coming up with the correct and clear procedure. Before the debate, Mr Chipasula again reminded the student teachers that what they were to report were the procedures only. For example:

Extract 8.22

> **Mr Chipasula:**… *Are you through here? Now it's time up, let's discuss your results. So I think, for example given we have now the rules, the procedures to be followed when multiplying decimal numbers, so let's start with which group, hands up, we will only need two groups, so let's start with this group, come and write down the procedure [giving the chalk to the presenter], the rules first, just the rules, … the particulars in the examples [student writing on the board], its time up for discussions, so lets observe what … [first presenter writing], this group you are making noise [teacher stands at the back, class quite], thank you,*

This extract confirms the focus and direction of what the mathematics teacher educator wants the student teachers to write on the chalk board. He says "*come and write down the procedure, the rules first, just the rules"*. This instruction indicates that he does not want any other calculation but just the rules only and assumes that student teachers will

comply. He continues to use direct imperatives and strong commands in his talk. For example, he says "*hands up*", "*we will only need two groups*", "*come and write down the procedure*" which reflects the compliance of the student teachers. This confirms the argument that, even though it looks like there is "freedom" for the student teachers, in fact they are still under the control of their mathematics teacher educator.

When the student teacher presents the rules, the mathematics teacher educator reads the rules to the whole class and then, to show his authority, the mathematics teacher educator rejects or accepts the rules given by the student teachers and then he opens up the floor for debate over the clear procedure. For example:

Extract 8.23

Mr Chipasula: *…so those are the rules according to this group, they are saying forget about the decimals, just regard them as whole numbers, count the decimal places in the multiplicand and in the multiplier after finding the answer, add the decimal places from both sides, that is one plus two is equal to three, count from right to left to find the expected answer according to the number of the sum of decimal places, that is three [reading the rules written by the first group], so they are using one, two, and three [the teacher speaks as he goes to the front], so I said general, so these are not general, they are from the example given, now do you think to the rest of the groups now, do you think this procedure a chap can manage to get the correct answer with those pre-requisite knowledge, is the procedure clear, is the procedure here clear [smiling]*

Ss: *[noisy background]*

Mr Chipasula: *…is it clear?*

SG: *it's clear*

Mr Chipasula: *…what are you saying madam?*

S3: *it's clear but to the learners it's complicated, it's clear but to the learners it's complicated*

Mr Chipasula: *…learners it's complicated, what type of procedure which is clear, so which group thinks its procedure is clear, yah, let's listen to this group, ah sit down madam, just read*

In extract 8.23, Mr Chipasula is seen to read out the rules that have been written by the student teachers on the chalkboard. Later, he is seen to reject the rules as not to be general. He says "*I said general, so these are not general they are from the example*

given." His rejection is also seen when he asked the question if the procedure is clear; "*do you think this procedure a chap can manage to get the correct answer*". This reflects his authority over the student teachers. It is a group discussion which is very much controlled, and the student teachers' discourse very much controlled.

To confirm this argument, it is also noted that there is no discussion initiated by the mathematics teacher educator to make the student teachers explain how or why they came up with that procedure or those steps. That there is no discussion regarding why the student teachers have come up with their procedure is consistent with the belief that the objective is for student teachers to learn the procedures for teaching school mathematics. In fact, the discussion during the lesson centered on the correct procedure that outlines the steps school learners should follow to solve the problem at the beginning.

Although the student teachers were very much controlled, sometimes they would challenge the mathematics teacher educators' choice of words. For example, in extract 8.24, Mr Chipasula mentioned that the student teachers should tell their learners that they should "forget" the decimal points given in the numbers when they are multiplying the two decimal numbers. However, the word "forget" did not make sense to some of the student teachers. The student teachers were arguing that the decimal point is part of the decimal numbers given and, therefore, should not be forgotten. After some contributions from the student teachers, he did not give a summary or an answer to the question posed, instead, he allowed another question on the floor. The extract below is taken from the middle of the lesson.

Extract 8.24

S7:	*why are we forgetting these decimal places, because they are part of the numbers?*
Mr Chipasula:	*why are we forgetting these (pointing to the points), because they are part of a number, that's another question*
S8:	*and seconded by another question*
Mr Chipasula:	*no, wait, one question at a time [pointing to another student],*
S9:	*I think it's a way of the answer*
Mr Chipasula:	*it's a way to*

S9: *to the answer.*
Mr Chipasula: *the way to the answer.*
Mr Chipasula & Ss: *[laughing]*
Mr Chipasula: *it's the way to the answer [pointing another one].*
S10: *I think it's for the learners to multiply the numbers, so we …*
Mr Chipasula: *because we know that our learners by this time they know multiplication of whole numbers so what they find this easier for them, that's what he is saying …*
S11: *[not clear]*
Mr Chipasula & *Ss:* *[laughing]*
Mr Chipasula: *so it's the way, so this one is used to this one so madam,*
S12: *[not clear] class making noise*
Mr Chipasula: *you are making noise, it is*
S12: *the simplest method*
Mr Chipasula: *the simplest method*
Ss: *how?*
Mr Chipasula: *you see to her it's the simplest method*
Ss: *how?*
Mr Chipasula: *do we have the simpler method than this one, on the same question?*

In this extract, Mr Chipasula welcomed the question and rephrased the question so that everybody heard it and redirected it to the whole class. He did this in order to request information and explanations from the student teachers in the class. This redirection of the question, however, is not the case where the teachers feign ignorance (Pimm, 1987). Rather it was a way of refusing to answer the question because he did not know the answer at the end. In this debate, there was no explanation from the mathematics teacher educator why he had chosen to use the word "forget" that convinced the student teachers nor were there any clarifications of ambiguous referents. However, Mr Chipasula did not settle the matter and so some minutes later the same question reappeared but now in a different way.

Extract 8.25

S16: *its better to use ignore temporary that to forget*
Mr Chipasula: *you just ignore it temporary*
S16: *so if we say forget we are …*
Mr Chipasula: *okay, this one is saying its better to say, let's say just ignore it temporary not forget, because if we forget, he will forget forever*
Mr Chipasula & Ss: *[laughing]*
Mr Chipasula: *but when you forget and remember to add, that's okay*

Ss: *[laughing]*
Mr Chipasula: *the only*
Ss: *[laughing]*
Mr Chipasula: *bad thing is only when they forget here, they also forget here*
S17: *its mathematics and not …*
Mr Chipasula: *its mathematics*
Ss: *ah*
Mr Chipasula: *provided you tell your learners what you mean by saying you forget or ignore what, temporarily*

It seems that the student teachers, apart from wanting the conceptual understanding, were also not comfortable with the word "forget" that Mr Chipasula had used and so one of the student teachers proposed the word "ignore" instead of "forget". He rephrased the student teacher's idea while contemplating it. He also welcomed the idea. However, he defended his choice of word by indicating that "*but when you forget and remember to add, that's okay*". And he indicated that "*the only…. bad thing is only when they forget here, they also forget here*". So as long as the learners remember to add the decimal point in the solution then that is fine.

The point here is that, even though student teachers would challenge their mathematics teacher educator, Mr Chipasula ensured that the focus was on the procedural discourse - the student teachers being able to solve the multiplication and find the correct answer. He allows the change of a word but not a change in discourse. Seeming to understand the mathematics teacher educator's directions, the student teachers accepted it though.

I followed up with Mr Chipasula on why he focuses much on formulating the procedures for mathematics teaching. Mr Chipasula said this in response:

Extract 8.26

Mr Chipasula: *umh the aim is, I think since they will be teaching the primary school, so sometimes we, I give them procedure or I want to check do they really know if I am using the, if I am asking them questions. do they know this one, because I believe that if they know how to solve it they can easily teach, so I would check do they know these step what about this one, what about this one so if am convinced that they know all these steps, I am sure that they can easily teach*

From this extract, Mr Chipasula's procedural discourses for school mathematics teaching seem to be planned well in advance. In other words, to Mr Chipasula, if the student teachers know the procedure of how to get to the correct answer, then the student teachers will be able to teach that particular area. Thus, even though he prefers group discussions in his class, and positions himself as a facilitator, he advocates using procedures for school mathematics teaching that position school learners as passive recipients. In this case, the discourse of facilitation in a college mathematics classroom goes together with the discourse of procedures for school mathematics teaching.

This argument is also confirmed by the following extract, where Mr Chipasula was telling the student teachers that

Extract 8.27

Mr Chipasula: *if a learner is able to follow these steps, these rules, these are just some of the rules, then that learner can get correct answer, questions …*

Mr Chipasula also confirmed to me that what he tells his student teachers is what is expected of them. If the student teachers do something other than what they were told in his class, then it is wrong.

Extract 8.28

Mr Chipasula: *sometimes yah, when we are teaching the methodology of how to do the actual teaching in primary school, we want them, to at least follow what we are doing here and demonstrating to them, that's why there was an issue of dressing the room, [laughing], so that they know what teaching materials are needed for example like in our case we used place value box so we want them to also produce that place value box when teaching in their various schools..*

Extract 8.29

Mr Chipasula: *with the MITTEP group, because they were starting with an orientation of two weeks and they go into schools to teach, so they paired with the head teacher give them or share their experiences with them, and when they come back here it was difficult to switch the normal which was not correct, lets do it in this way and sometimes we can see that they have*

> *changed but when we send them back they switch back to there, but with this group since we have not started them how they are doing, I don't know how they will fare,*

In general, Mr Chipasula is positioned as both a facilitator and a director in relation to his student teachers. However, his discourse positions the mathematics teacher as the primary knower (Pimm, 1987), who is supposed to impart knowledge to the school learners.

8.6 Summary and Conclusion

By applying the textual and discourse practice analysis, three main different discourse practices that dominated the mathematics teacher educators' classrooms and that go hand in hand with the directive discourse and procedural discourse are identified: directive discourse in an IRE discourse practice and in a traditional lecturing discourse practice; and procedural discourse in group discussions. It can not be assumed that it was the mathematics teacher educators' intention, however, to produce such types of discourses. However, the discourses across these mathematics teacher educators mirror the conventional discourses that are enacted in primary/secondary multilingual mathematics classrooms, using the process of social practice analysis as described in chapter 6, section 6.3.3. In one way, the analysis of this chapter indicates that the discourse practices in the college mathematics classrooms involved in the study are similar to those being displayed in a school mathematics classroom.

Comparing the findings in this chapter against the existing literature (chapters 2 - 3) and the practices of various discursive events that take place in multilingual school mathematics classroom, the results suggest that discourse practices produced in a college mathematics classroom are similar (but not all) to the discourse practices that are produced in a school mathematics classroom. These discourses focus on conventional practices, meaning that the act of production has centered on the mathematics teacher educators being professionals and experts. For example, this practice happens when the mathematics teacher educators prefer to offer directives, give explanations and prescriptions to the student teachers rather than allowing the student teachers to discuss, analyze or summarize in order to seek their own answers. In these

cases the mathematics teacher educators speak more than the student teachers. Therefore, one can argue that the discourse practices centers on the mathematics teacher educators.

In chapter 3, I pointed out from the literature some of the strategies that mathematics teachers employ in multilingual mathematics classrooms. One of the strategies that teachers in most multilingual mathematics classrooms, where the LoLT is different from the home languages of the learners produce is mostly the IRE pattern of discourse that goes together with the procedural discourse. I gave examples of studies conducted by Krashen (1982), Le Roux (1996) and Long (1983) indicating that the IRE pattern of discourse is a common phenomenon in multilingual mathematics classrooms.

The discourse practices that have emerged as the mathematics teacher educators prepare the student teachers are embedded in conventional practices of multilingual classrooms – the act of production that centers on the mathematics teacher educators as being professional and experts. Also considering the discourses being displayed in a college mathematics classroom, the way in which mathematics is taught reflects the traditional focus on acquisition of facts, mastery of procedures and technical skills. These practices limit the student teachers' involvement in learning how to teach mathematics and uphold the prominent teacher role. The question that arises here is whether the discourse practices reflected in the multilingual school mathematics classroom is the reproduction of what the teachers are exposed to in teacher education programmes. Although this might be difficult to answer now, the findings here show a match in these discourse practices and so it might be possible to argue that partly, the discourse practices displayed in multilingual classrooms might come from the college mathematics classroom.

Emphasis on the procedural way of teaching mathematics in a college mathematics classroom highlights the fact that student teachers are not exposed to other discourse practices in teaching mathematics. As pointed out in chapter 3, Dufficy (2001) argues that different discourse practices encourage learners to construct joint understandings of the world. Similarly, research on effective instruction for learners whose main language

is not the LoLT emphasizes the importance of using a variety of methods (*discourses*) tailored to learners' needs (August & Pease-Alvarez, 1996). August & Pease-Alvarez continue to explain that instructional methods (*discourses*) selected depend on the level(s) of English language proficiency and available resources among other factors. Using multiple approaches (*discourses*), Reyhner & Davison, (1993) and August & Pease-Alvarez, (1996) argue that teachers can meet the needs of a wider variety of learners. This is indeed a challenge for mathematics teacher educators.

In the discussion of the mathematics teacher educators' lessons, I have identified and then tried to explain the commonly used discourses for mathematics teaching. I have illuminated what the mathematics teacher educators' discourses are, in particular areas that they want to promote and preserve. There are ranges of discourses such as multilingualism that remain untouched by these mathematics teacher educators. In all these lie significant challenges for the mathematics teacher educators which clearly need to be revisited and include opportunities for the student teachers to engage explicitly with the challenges that exist in multilingual mathematics classrooms.

CHAPTER NINE

CONCLUSIONS AND RECOMMENDATIONS

9.1 Introduction

As I indicated at the beginning of this thesis, the initial motivation for my study was to explore the discourse practices of the mathematics teacher educators in the initial teacher training colleges in Malawi. In concluding, I would like to return to my original concern about training the student teachers for multilingual mathematics classroom in teacher education programmes. Having considered the discourse practices of the mathematics teacher educators in the two TTCs in Malawi in depth, I suggest that to assist the student teachers, action by both the mathematics teacher educators and the Ministry of Education in Malawi should be taken.

The focus on the discourse practices of the mathematics teacher educators, as I noted in chapter 1, arose from my own experiences, both as a mathematics teacher and mathematics teacher educator (section 1.1). The focus was also influenced by an examination of the accounts of other researchers on the topic of teaching and learning mathematics in multilingual classrooms. The studies conducted by Adler (2001), Kaphesi (2001, 2003), Moschkovich (1999, 2002), Setati (2005a) and other researchers show that teaching and learning mathematics in a language that is not the first language of the learners and of the mathematics teachers is complex and can create dilemmas for teachers. This literature gave the framework as to the challenges and issues that arise in the process of teaching and learning mathematics in bi/multilingual classrooms in which learners are still learning the LoLT. Thus the combination of my experience and the literature reviewed led me to question how mathematics teachers are being trained in teacher training programmes. As such, the questions that arose for me were: can there be a way of preparing mathematics teachers in initial teacher education programmes on what to do if they meet these challenges? What is it that they do now that would help the student teachers? In general, what are their discourse practices?

Thus, this research project focused on the following research questions:

1) What are the discourse practices that mathematics teacher educators display in their descriptions of multilingual mathematics classrooms?

2) a) What are the discourse practices that mathematics teacher educators display in a college mathematics classroom?

   b) How do they make available the discourse practices for the student teachers to draw on?

9.2 Discussion of the results

In answering my research questions, I used Fairclough's CDA (Fairclough, 1989, 1995a, 1995b, 1995c, 2000, 2003) approach to explore and explain the discourse practices of the mathematics teacher educators in the college mathematics classrooms. Fairclough's CDA theory considers the use of language as a form of social practice (Fairclough, 1989, p. 20; Fairclough & Wodak, 1997, p. 258) and the context of language as crucial to discourse (Wodak, 2001). As discussed in chapter 4, exploring language (whether written or spoken) is fore grounded in the CDA process of analyzing discourse. According to Fairclough (2003), language is considered as one of the key raw materials out of which specific discourses get shaped (p. 2). The notion of Fairclough's CDA in this study was used to make explicit the discourse practices that mathematics teacher educators produce in their talk and interaction with the student teachers in a college mathematics classroom in Malawi. The study has shown that while there are some disconnections between the discourse practices produced in a multilingual school mathematics classroom and a college mathematics classroom, some of the discourse practices that mathematics teachers produced in a college mathematics classroom reinforce the common discourse practices being produced in multilingual mathematics classrooms.

The discourse practices of the mathematics teacher educators that emerged in this study will be discussed around four general themes, namely:

- Code-switching in a college mathematics classroom.
- Dilemmas of code-switching in a college mathematics classroom
- Policy and practice in a college mathematics classroom.
- Patterns of instructional strategies in a college mathematics classroom

9.2.1 Code-switching in a college mathematics classroom

Code-switching is the common phenomenon in multilingual classrooms (Akindele & Letsoela, 2001; Holmes, 1992; Martin, 2002; Sert, 2005; Setati, 2005b) especially in classrooms where the teacher and the learners share a common language, but have to use an additional language for learning (Setati 2005b).

Code-switching is beneficial in a multilingual classroom because of a number of reasons such as teachers are able to re-explain the mathematical concepts or difficult concepts in the learners' home language(s). As discussed in chapter 3, Setati's (1998) study showed that switching between the learners' home language and English by learners and teachers enhances the quality of mathematical interactions in the classroom. In her study, Setati demonstrated that procedural discourse dominated in classrooms where switching was restricted and if the teacher switched into the learners home languages, this correlated with conceptual discourse.

In my research, the discourse that appears to be evident, is that, multilingualism is seen as a problem and that the use of other languages other than English in a college mathematics classroom is problematic. The mathematics teacher educators described their classrooms as multilingual not because student teachers speak different home languages, but because student teachers are allowed to use their home languages when they fail to speak in English. Viewing multilingualism and code-switching in a positive sense seems likely to provide some benefits for mathematics teaching and learning, as this would allow the teachers to use the notion of multilingualism and code-switching as a tool for thinking about how to engage the student teachers with multilingual discourses and about forms of pedagogy that can help the mathematics teacher

educators and the student teachers to develop strategies of dealing with the challenges that exist in multilingual classrooms. On the other hand, viewing multilingualism or the use of other languages in a classroom as a problem seems likely to perpetuate the disadvantage and marginalization of multilingual learners.

While code-switching is observed as a main language practice in school multilingual mathematics classrooms (Akindele & Letsoela, 2001; Holmes, 1992; Martin, 2002; Sert, 2005; Setati, 2005b), it was not the main language practice in the college mathematics classrooms I visited as the mathematics teacher educators did not encourage it. Code-switching was done only when student teachers were given an opportunity by their mathematics teacher educators to use the home language. It was not a spontaneous practice; rather, it was a much controlled practice. Thus the way code-switching is practiced in schools is different from the way code-switching is done in some college mathematics classrooms in Malawi.

This finding is surprising since it is not what I expected. My expectation was that there would be some understanding by the mathematics teacher educators to use some language practices that are more likely to happen in a multilingual classroom. This does not necessarily mean that, the language practices of the mathematics teacher educators be the same as the language practices happening in school mathematics classrooms. Rather there should be some flexibility on the part of the mathematics teacher educators. In Malawian classrooms, the use of local languages can not be avoided, and therefore, student teachers need to graduate from the teacher training colleges better prepared to function productively when they begin to teach. Student teachers need to be engaged in language practices that they are more likely to encounter when they begin to teach. Teaching mathematics is challenging, and more so in multilingual classrooms since teachers are engaged in a range of language practices.

Chekaroua (2004) reported that, in Niger, the student teachers who were not trained for bilingual classrooms and are not exposed to how they can accommodate the different languages in a multilingual classroom, found it very difficult to accommodate different languages when they began to teach in various schools. While the student teachers that

were exposed to accommodating different languages during teaching found it easier to accommodate different languages in multilingual classrooms. If we are to go by these results, this study confirms that student teachers in college mathematics classrooms that I visited are not adequately trained for multilingual classrooms and that they may not be sufficiently prepared to face the challenges that exist during the teaching and learning of mathematics in multilingual classrooms. So it is important that mathematics teacher educators start to view multilingualism and code-switching in a positive sense and recognize the use of home languages as a resource rather than a problem (Moschkovich, 1999; Setati, 2001, 2005b) in their college mathematics classrooms.

Furthermore, code-switching in the college mathematics classrooms that I visited, was done for continuity purposes (Skiba, 1997). Code-switching was used due to an inability of expression. In this respect, code-switching stood to be a supporting element in communication of information and therefore it was used for communicative purposes. Even though code-switching was seen as a problem, the mathematics teacher educators acknowledged that the student teachers need to be helped in expressing themselves by the use of their home languages. There is a notion that student teachers are not able to express themselves in English and allowing them to switch to their home languages is seen to compensate for the deficiency.

9.2.2 Dilemmas of code-switching in a college mathematics classroom

The notion of code-switching, though helpful, has its own challenges and dilemmas. Mathematics teachers face a dilemma of whether to switch to the learner's home language or not during their teaching. Adler (1998, 2001) calls this a dilemma of code-switching. That is mathematics teachers may feel that if they switch to the home language of the learners, they are denying the learners access to the language of learning and teaching. Also if learners speak different languages in the classroom, which language would a teacher use so that no one is disadvantaged? Given the fact that most mathematics classrooms are multilingual, some learners will be disadvantaged. The teacher has to make a choice in this regard, whether she/he chooses to work with the language of some of the learners or not or use the colonial language.

The way the home languages are being used in the college mathematics classrooms that I visited, reflects what Adler (1998, 2001) calls the dilemma of code-switching. In the college classrooms where I did this study, the mathematics teacher educators allowed the student teachers to code-switch in order to help them verbalise their thinking as most of them were not fluent in English. At the same time, it was the responsibility of the mathematics teacher educators to conduct their lessons in English as required by the LiEP. The analysis of this study suggests that the dilemma of code-switching is experienced more acutely in a college mathematics classroom than in schools. The view of the mathematics teacher educators was that, this is college and the LoLT is supposed to be English and not the home language. Yet at the same time the student teachers that they are training are going to teach mathematics in the home language of the learners. Thus the mathematics teacher educators are experiencing a dilemma - torn apart. For example, all the mathematics teacher educators who participated in my research revealed this dilemma when they complained that when they are very strict about using English they find "that the student teachers are not able to express themselves" and so they resort to use the home languages even though this is not allowed. In this case, the LiEP acutely contributes to the dilemmas of code-switching in a college mathematics classroom. This raises the question of how teacher educators can address the challenges which have been revealed in the literature pertaining to the language practices of mathematics teachers in multilingual classrooms in such a context.

The dilemma of code-switching takes on added significance in a college mathematics classroom than in schools. In addition to the change in LiEP to use home languages in schools, the student teachers will go to different environments where the home languages are different as well. I feel that it is not possible to use all the languages that can be used for school mathematics teaching in a college mathematics classroom. In Malawi, for example, there are more than sixteen languages. How can student teachers be trained in all these languages in a college mathematics classroom? This argument however, does not imply that preparing student teachers for teaching in multilingual classrooms means using the student teachers' home languages or code-switching during teaching only. Rather the argument is that, student teachers need to be exposed to how they can accommodate the different languages in a multilingual mathematics classroom.

9.2.3 Policy and practice in a college mathematics classroom

Although the intent of my study was not to evaluate the LiEP in Malawi, it has revealed some disconnection that exist between the LiEP followed in schools and the LiEP being followed in primary teacher education programmes. As discussed in chapter 1, the LiEP in Malawi stipulates that the home language(s) of the learners should be used as LoLT for the first four years of schooling (that is standard 1 to 4) and English be the LoLT for the upper primary, secondary and tertiary education as summarized in table 9.1.

Table 9.1: Malawi National Policy on LoLT

Level of Education		**National policy on LoLT**
I	Lower Primary Education (Standard 1-4)	Home languages
II	Upper Primary Education (Standard 5 – 8)	English
III	Primary Teacher Education	English

Table 9.1 illustrates the LiEP gap that exists between lower primary education and the primary teacher education. The LiEP for lower primary education stipilates that primary teachers should use home language(s) of the learners during teaching and learning in their classrooms. However, even though the policy says so for lower primary school, it does not stipulate that for the primary teacher education. According to the policy, the teacher educators are not free to use the local languages in a college mathematics classroom, even though the student teachers that they are training are going to use the home languages at one point when they begin to teach. This was observed in the classrooms where I conducted this research.

All the four mathematics teacher educators observed in this study were using English throughout their teaching. They all explained to me during pre-observation interviews that, Chichewa is only used when the content under discussion is for the lower primary school (standard 1 - 4). Sometimes they use Chichewa only for some specific terms and not the whole lesson. However, during classroom demonstration, the mathematics teacher educators mostly used English even though the content that they were teaching was for the lower primary school.

The mathematics teacher educators modeled the teaching of lower primary school in English, and then the student teachers were practicing the teaching in Chichewa as shown in Table 9.2. When I followed up on this issue, all the mathematics teacher educators involved in this study indicated to me that it is the student teachers who are going to use the home language when they begin to teach, and so they are the ones who have to practice in Chichewa.

Table 9.2: Mathematics teacher educators and student teachers practices in a college mathematics classroom

	Content for standard 1 – 4	**Content for standard 5 – 8**
Mathematics Teacher educators	Modeling the teaching of mathematics in English	Modeling the teaching of mathematics in English
Student Teachers	Practice the teaching of mathematics in Chichewa	Practice the teaching of mathematics in English

Through the extracts of the four mathematics teacher educator's lessons, the study illustrated the influence of the LiEP on the nature of the language practices of the mathematics teacher educators on how the student teachers are being assisted and on how to implement the LiEP. It showed that while all the mathematics teacher educators moved towards helping the student teachers use the local language in mathematics teaching, they all faced the challenges of how to demonstrate the teaching of school mathematics in Chichewa. The findings of this research seem to suggest that, the mathematics teacher educators shift the responsibility of preparing the student teachers on how to use local languages to the student teachers themselves. In other words, the mathematics teacher educators do not commit themselves fully to the use of local languages because of the LiEP at tertiary education and also because they are not the ones to teach in the local languages in primary schools. This raises a question as to what the role of the mathematics teacher educators is in helping the student teachers to implement the LiEP. And whose responsibility is it anyway, student teachers or mathematics teacher educators? How can the LiEP be implemented if the mathematics teacher educators do not model the teaching and learning of mathematics in local languages, and yet expect their student teachers to do so?

This study has shown that the dominance of English is well established in a college mathematics classroom. Currently the practice is that mathematics teacher educators demonstrate everything in English, all the teachers' guide textbooks are in English, the student teachers are required to write the lesson plans in English; yet, the teaching by the student teachers is to be done in Chichewa. This reveals how complex it is to train the student teachers where the LiEP is not the same as the LiEP that they are going to use when they begin to teach. These findings suggest that unless there is some flexibility in the LiEP, the use of English in college mathematics classrooms will continue even though the student teachers will teach in local languages at some point. The problem here is the system under which the student teachers are being trained does not give them support in terms of what and how to teach by engaging in the use of multiple languages.

The study shows that, the LiEP gap between the lower primary education and the tertiary education parallels the multilingual discourse practices gap between the schools and the college mathematics classrooms. Even though there might be other ways of training the student teachers for multilingual classrooms, it is reasonable to argue that mathematics teacher educators should engage their student teachers in some kind of discourse practices that will help them to function productively in any classroom environment that they would find themselves in. The discourse practices of the mathematics teacher educators are in themselves problematic as they do not necessarlily connect to the primary concerns of teaching and learning mathematics in multilingual classrooms. The student teachers are not exposed to the language practices that take place in schools during teacher training. As such the study suggests that there is a disconnect, between what the student teachers go through in teacher education and what they will meet when they begin to teach. In other words, the teacher education does not connect the college discourse practices with the multilingual discourse practices, such as code-switching, that the student teachers would be required to use at some point when they begin to teach. Given that the parallel of the two gaps is not a mere coincidence, it follows that while we want to work on training/preparing the student teachers for multilingual mathematics classrooms where the LiEP allows the use of

home languages, we also need to consider the LiEP and the discourse practices at tertiary education.

Besides, the study has shown that to improve language use in the college mathematics classroom, firstly the implementation of the LiEP needs to be flexible. Secondly, mathematics teacher educators' language practices need to be enhanced. Thirdly, while we want to work on assisting the student teachers to improve in their language practices, we also need to model the teaching and learning of mathematics in local languages during teacher education.

By way of concluding this section, I pose the following questions: How can the teacher education address the challenges which have been revealed in the literature pertaining to the language practices in multilingual classrooms when policy in teacher education bars teacher educators from using local languages in their teaching? LiEP in teacher education is in conflict with the LiEP in schools, and yet the dilemmas have been established pertaining to the language practices. How can these dilemmas be resolved in such a context?

9.2.4 Patterns of instructional strategies in a college mathematics classroom

While the study shows the disconnect between the LiEP and the multilingual discourse practices between schools and colleges, there are some classroom discourse practices that reinforce each other. In chapter 3, I pointed out from the literature some of the strategies that mathematics teachers employ in multilingual mathematics classrooms. Teachers normally resort to code-switching when they want to explain, clarify, or check understanding among other things. I also pointed out that in most multilingual mathematics classrooms, where the LoLT is different from the home languages of the learners, it is mostly the IRE pattern of discourse that goes together with the procedural discourse being displayed. I gave examples of studies conducted by Krashen (1982), Long (1983) and Le Roux (1996) indicating that the IRE pattern of discourse is a common phenomenon in multilingual mathematics classrooms.

Three types of discourse practices commonly used in a college mathematics classroom were observed and these are: (i) the *IRE discourse practice* and its extension to include the use of directive and procedural discourse. This type of discourse practice possesses a traditional pattern of discourse such that the mathematics teacher educator asks a question, the student teachers answer and the mathematics teacher educator evaluates. (ii) the *traditional lecturing discourse practice*. Here, the emphasis and decisions revolve around the mathematics teacher educator who shows his/her expertise and gives instructions to the student teachers. The role of the student teachers is to comply and later to reproduce what they have been taught. This discourse practice entails recognizing the authority that mathematics teachers have over the passive learners; (iii) lastly there is *group discussion.* What was surprising in this last type of discourse practice was that there was much emphasis on formulating the procedures for school mathematics teaching rather than on how and why questions.

The analyzed discourse practices in a college mathematics classroom centered more on the procedural discourse than conceptual discourse. These mathematics teacher educators expressed a good deal of concern that their student teachers understood the calculational procedures and they had positive intentions for using that. However, their discourse practices ignored the conceptual discourse for mathematics teaching. The absence of student teachers articulating their ideas, reflecting upon them and refining their understanding supported this argument.

Furthermore, the analyzed data in chapter eight contains examples of how the discourse practices of mathematics teaching was presented to the student teachers which includes rephrasing and representing student teachers' presentations, and reproduction of what has been taught as a measure of whether student teachers have understood how to teach the topic under discussion. One of the conclusions that can be drawn from the analysis of this study is that, while in primary and secondary schools, it makes sense to use these language practices to help enhance the leaner's participation in a mathematics classroom, in the college mathematics classrooms that I visited, revoicing or rephrasing is done not to expose the mathematical discourse but rather the discourse for school mathematics teaching. It is assumed by the mathematics teacher educators that, the

student teachers have already developed the mathematical discourse and that, what remains is to teach them a discourse for school mathematics teaching. So they model the discourse of how to teach rather than modeling the mathematical discourse itself. The different settings between college and schools most likely would shape different discourses. Thus the focus and emphasis of the discourses for these two different institutions is also different. However, the point I am trying to bring across here is that, even though the practices are different, the practices of these different institutions need to inform each other. The practices being involved in the school classroom and college classroom need to be a two way process, what happens in schools need to inform the college practices and college practices inform the school practices.

Overall, the discourse practices that emerged in the college mathematics classroom all reflect limited student teachers involvement during interaction. In this study, it is seen that the limited involvement of the student teachers was triggered by the way the mathematics teacher educators conducted the discourse in their classrooms namely by giving little or no chance at all for the student teachers to be active by offering opinions. For example, student teachers were limited to answering the teacher educators' questions and were restricted to following the teacher educators' prescribed boundaries. This is also seen when student teachers were allowed to reproduce only what they had learnt in their college classroom and closing down of all other alternative methods that could be used in solving a particular problem. Student teachers were also directed to use the procedures that had been presented by their teacher educators. For those that were given a chance for group discussions, they were very much directed and controlled; the directions for the discussion were prescribed in advance, they were given clear content boundaries and they were supposed to follow the mathematics teacher educators' commands.

Klein (1998) noted that teacher educators take for granted the 'supportive' nature of the environment of the mathematics classroom. And she had a

> General feeling that students in the course are enjoying it, are learning a lot and may be accepting that mathematics doesn't have to be as they experienced it at school. BUT … it is clear that there is one way to teach mathematics, that I know it, and that is should tell them. Learning, for

> them, is equated with being told. Where will I find some notion of autonomy or empowerment in the students – which they will come to rely more on their capabilities and convictions, (p. 81)

Klein continues to argue that it is little wonder then that student teachers later when they begin teaching in various schools, venture into classrooms where they (re)produce the (discriminatory) practices they 'knew' at school and in teacher education programmes. Since these practices are (re)constituted and (re)affirmed in teacher education they may be blind to classroom practices which are discriminatory, enabling or empowering.

The findings of this study confirm Klein's observations, in that, the mathematics teacher educators in this study (re)produced, (re)constituted and (re)affirmed the discourse practices commonly used in multilingual classrooms, such as the IRE and the procedural discourse. Furthermore, maintenance of ideology of culture of expertise, preservation of the high status of their identity and mathematics seems to feature highly. As a result, the student teachers are exposed to the well-organized and structured way and are engaged with the traditional way of teaching mathematics. The mathematics teacher educators appear to be aiming to connect with what is legitimate with the "society" and taking a stance that they are there to motivate student teachers, and help them learn, and that this can be done by giving information rather than quizzing the student teachers. In other words, it seems that the mathematics teacher educators discourse practices focus on training the student teachers as a way of maintaining and preserving the existing discourse practices.

Therefore, it appears that when the focus is on (re)producing, (re)constituting and (re)affirming the conventional discourses of mathematics teaching, the student teachers may be blind to the other discourse practices that can be effective for teaching mathematics in a multilingual classroom. The effect of the focus on preserving the discourse on the mathematics teacher educator's actions might deflect them from the substance of dealing with how to teach mathematics in multilingual classrooms. To improve the teaching and learning of mathematics in multilingual classrooms, it is

necessary to focus on both practices (multilingualism and the established discourses), though this might have its own challenges.

9.3 Recommendations

In view of the key issues raised in this research project, this section will discuss the recommendations I have made so that mathematics teacher educators might be better placed in preparing the student teachers for teaching mathematics in multilingual classrooms. First, I will present the recommendations for the Department of Teacher Education (DTED) in Malawi and then later I will present the recommendations to the mathematics teacher educators.

9.3.1 For the Ministry of Education and Department of Teacher Education (DTED)

This study has implications for the mathematics teacher educators and has a number of recommendations for the Ministry of Education and Division of Teacher Education Development (DTED). These include: the need to address the gap between the LiEP in school and LiEP in teacher education programmes; development of a course unit on language and mathematics; and workshops and in-service training for the mathematics teacher educators

Address the gap between the LiEP in schools and LiEP in teacher education.

First of all, I would like to indicate that although I take the gap in the LiEP as one of the contributing factors to the gap in the discourse practices being produced in a college mathematics classroom, I do not necessarily regard addressing the gap as a way of improving the discourse practices in college mathematics classroom. Rather, I believe they should be addressed simultaneously, and that work on each should support the improvement of the other. Since they are interdependent processes, we cannot expect to address the LiEP issue first, and in so doing automatically address the discourse practices in a college mathematics classroom.

As I discussed in this chapter and in chapter 2, the LiEP that allows the use of home languages in schools gives the teachers in a mathematics classroom flexibility to use multiple languages to the betterment of the learners. The quality of the interaction between the learners and the teachers in a mathematics classroom depends on the flexibility of the LiEP as well. Given that the LiEP at tertiary education does not yet provide the mathematics teacher educators with that flexibility of being able to use multiple languages freely, their base for using multiple languages in a college mathematics classroom is weakened. As this study has shown, the mathematics teacher educators did not allow their student teachers to code-switch in their classrooms unless that opportunity was given because the LiEP does not allow them to do so.

Development of a course unit on language and mathematics

A lot has been done in the teacher training colleges about teaching and learning methods, teaching and learning theories, classroom management, writing schemes and records of work and lesson plans. Not much, if any, is being done in the area of language and mathematics. The area of language and mathematics is a very important area to be considered more especially now-adays that classrooms have learners with diverse cultural and language backgrounds. Thus, I further recommend a unit or a course of study in this area in teacher training colleges. This course is being offered in other institutions such as University of Witwatersrand in Republic of South Africa, of which we can learn from. A language and mathematics course should aim at developing in the student teachers an appreciation and understanding of the language issues and the challenges that arise in mathematics classrooms through the exploration of the relationship between language and mathematics. The course can cover areas focusing on teaching and learning mathematics in multilingual classrooms. Specifically, some of the topics to be covered can include the challenges that mathematics teachers meet in teaching mathematics, the language of mathematics and critical language awareness. This course can also include a research project that student teachers would undertake in researching teaching and learning mathematics in multilingual classrooms.

Insight into language issues and the challenges in school mathematics teaching through an introductory course on diversity is crucial as well. A language and mathematics course develops an appreciation and understanding of the language issues and the challenges that arise in mathematics classrooms through the exploration of the relationship between language and mathematics. Emphasis on this relationship builds a foundation for the understanding thereof. It may also encourage mathematics teacher educators to explore their own language challenges as a means to understanding how teaching mathematics in multilingual classrooms is complex and this may influence the way they will prepare the student teachers. In addition, it nurtures appreciation of diversity as a valuable human resource.

Workshops and in-service training for the mathematics teacher educators

It is evident from the findings of this research that mathematics teacher educators know some of the challenges and problems that exist in multilingual mathematics classrooms. However, the findings also show that they are not aware of the other challenges that mathematics teachers meet in multilingual classrooms as highlighted in recent research studies. As a result, mathematics teacher educators have not yet developed strategies that may help in preparing the student teachers for those environments. A programme, which includes continued workshops and in-service training for mathematics teacher educators, would be enriched by documented cases that highlight the challenges that mathematics teachers meet in multilingual classrooms. This will assist the mathematics teacher educators to recognize, talk about and act on these challenges. Such engagement will empower the mathematics teacher educators to make informed and contextually appropriate strategies to maximize teaching possibilities for student teachers who are going to teach in multilingual contexts.

Mathematics classrooms worldwide will continue to be multicultural and multilingual. The challenges and the dilemmas that exist in the teaching and learning of mathematics in these environments thus will continue to exist. Therefore, this requires that mathematics teacher educators to be sensitized about these problems and together find an appropriate way of preparing the student teachers for mathematics teaching. This

will make the teacher training programmes responsive to the changes that are happening all around. Mathematics teacher educators are the dominant groups that have the potential for reforming and developing strategies that may help in a multilingual classroom. At the same time, these mathematics teacher educators can be agents of change and so this will in turn contribute to making positive changes to the way they prepare the student teachers for mathematics teaching in multilingual classrooms. In light of this, it is recommended firstly that workshops and in-service training for mathematics teacher education programmes be organized by the Ministry of Education through the Department of Teacher Education Division (DTED) with the aim of sensitizing the mathematics teacher educators to the challenges that exist in multilingual mathematics classrooms. In-service workshops and programmes on language and mathematics in general are crucial and necessary.

9.3.2 For mathematics teacher educators

Mathematics teacher educators researching their own student teachers

Most literature recommends teachers to do action research as this helps them to reflect on their practices and change accordingly. However, in this research I also recommended that the mathematics teacher educators be involved in researching their student teachers when they begin to teach mathematics in various schools. This would help the mathematics teacher educators know how the student teachers who have gone through their training are faring on the ground. It should be noted here that this research is not for grading the student teachers but rather for the mathematics teacher educators to reflect on their discourse practices. Through such involvement, mathematics teacher educators could realize how complex it is to teach mathematics in multilingual settings. In this regard, such a move would explicitly bring to the fore the challenges that exist in the mathematics classrooms. This will help the mathematics teacher educators to see the challenges that exist and have first hand information and thereby be in a better position to help the student teachers. Before I started this study, I had a very simplistic view of training the student teachers who are going to teach in multilingual classrooms, but what I have seen and discovered from this study has helped me change my perspective

of how to train the student teachers for multilingual classrooms. In the same way, it is in my conviction that, if this practice of researching their student teachers is appropriately done and sustained, the mathematics teacher educators would be able to make the transition from the perceptions that they currently hold to new perceptions of how to train student teachers for mathematics teaching in multilingual contexts. However, for this research to happen, the other factors and conditions such as funding for the research have to be taken care of.

In addition, it is envisaged that researching their student teachers when they begin to teach, is bound to promote the professional growth of the mathematics teacher educators and hence put them in a better position. They will be enabled to manage and facilitate their mathematics classrooms in a way that recognizes the multilingual settings, use of different home languages, and how these languages can be used as a resource in mathematics teaching.

9.4 Directions for future research

According to the key findings of this research project, this section presents a number of areas that can be looked at in terms of future research.

Firstly, I propose a more rigorous research on teacher education programmes and mathematics teacher educators' discourse practices in order to provide more understanding of what I have discovered in this research. It is important to pursue such a research agenda and to generate policy action from such a broad-based empirical experience. This thesis has revealed that mathematics teacher educators view code-switching and multilingualism as a problem rather than a resource and that the training of the student teachers to use multiple languages is left to the student teachers themselves. Furthermore, this research has shown that some of the discourse practices of mathematics teacher educators in a college mathematics classroom today are more influenced and restricted by the LiEP. The question to ask here is, how widespread are these phenomenon that I have discovered? Are these the views of every mathematics teacher educator in college mathematics classrooms? Exploring these questions will

provide a more understanding of the phenomenon, and hence generate a more relevant and viable policy action.

Secondly, the findings of this study indicates that the discourse practices in the college mathematics classrooms involved in the study are similar to those being displayed in a school mathematics classroom. The question that arises here is whether the discourse practices reflected in multilingual mathematics classrooms are the reproduction of what the student teachers are exposed to in teacher education programmes. This is an important question for future research to explore.

Thirdly, this study has shown that mathematics teacher educators do not model the mathematics teaching in local languages in their college mathematics classrooms. They rather model the teaching of mathematics in English. However, the student teachers sometimes practice their teaching in local languages. It would be interesting to explore further as to what happens to the mathematical discourse as student teachers move from teaching in English to the use of mathematical discourse in local languages. Whether the mathematical discourse remains the same or not and what would be its effect.

Fourthly, a continued study as a follow up with the student teachers when they graduate from these colleges is also desirable. The focus of this follow up study is to find out the student teachers perspectives about the language practices that they have undergone in a college mathematics classroom; whether the language practices that they were engaged in have added any value in their teaching. Furthermore, this study would allow the research to find out what the student teachers would recommend as to what can be done in college mathematics classrooms that would help them function productively in a multilingual mathematics classroom.

Finally, the findings of this research indicate that the dilemmas of code-switching (Adler, 1998, 2001) are more acute in college mathematics classrooms than in schools. More research can be done here to find out if the other dilemmas that Adler (2001) describes exist in a college mathematics classroom. For example, the dilemma of mediation, when teachers move towards the learner's preferred language; and the dilemma of transparency, when the teacher spends time explicitly teaching

mathematical language. The information obtained here may help in how the teacher educators can come up with strategies and solutions of how to train student teachers to handle the dilemmas in their classes.

9.5 Conclusion

In this study, I investigated and analyzed the discourse practices of the mathematics teacher educators in initial teacher training colleges in Malawi. In the process, I explored the descriptions that these mathematics teacher educators have about a multilingual classroom. Furthermore, I also investigated the dominant discourse practices in their mathematics classrooms and in the process discovered what they seek to promote and advance as they prepare the student teachers for mathematics teaching.

In this study, I have shown that mathematics teacher educators view code-switching and multilingualism as a problem rather than a resource in a college mathematics classroom; that while code-switching is the main language practice in schools, it is not the main language practice in college mathematics classroom, it is rather very much controlled; and that the dilemmas of code-switching are acute in college mathematics classrooms.

Furthermore, this study has shown that while there are some disconnections between the discourse practices produced in a school multilingual mathematics classroom and a college mathematics classroom, some of the discourse practices that mathematics teacher educators produced in a college mathematics classroom reinforce the common discourse practices produced in multilingual mathematics classroom.

The ideas generated in this study illuminate realities of the discourse practices of mathematics teacher educators in other colleges and settings. This research has provided in-depth understanding of, and insights into, the discourse practices of the mathematics teacher educators in initial teacher training colleges that may serve as a starting point for further exploration through other methodologies.

Based on the above research findings, I have made a number of recommendations for the mathematics teacher educators to be in a better position to expose their student teachers to “ideal” practices for mathematics teaching in multilingual classrooms.

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APPENDIX A: EXAMPLES OF PRE-OBSERVATION INTERVIEWS

MRS. JOSHUA

Researcher: *as I said last time kuti its about language and mathematics, our aim is, just a little background one … and the other issue that we are looking at is the, we are looking at the issue of problems that arise in primary schools what problems do they face what language issues do they face, that the mathematics teachers face when they are teaching in primary schools and I also want us to look at the challenges that, the language challenges that you meet here when you are preparing these teachers so its like it has three, three parts , the official Language-in-Education Policy but also the problems that our teachers meet to teach in primary schools, that is in mathematics classrooms and the challenges that you meet here, basically those are the three areas. So there is a term that am using in my research, it's about multilingual, I don't know if you know anything about multilingual classroom.*

Mrs. Joshua: *ah, multilingual in my understanding, multilingual is about using different languages*

Researcher: *using different languages in the sense like kuti like your class or wherever you can have students that may be speaking different languages... So when we say multilingual classroom we are talking of a classroom with more than two languages, may be from that explanation, how would you classify your class*

Mrs. Joshua: *it should be a multilingual*

Researcher: *it's a multilingual*

Mrs. Joshua: *yes*

Researcher: *have how many languages*

Mrs. Joshua: *basically two, English and Chichewa*

Researcher: *ok, apart from that any languages that you use*

Mrs. Joshua: *ah I should say no because these other languages, like others want understand ah but for Chichewa because its almost anyone, yah, so that's why, but we are supposed to use English but just for the sake of making yourself clear at the same time making them understand, yah,*

Researcher: *ok so it's like when teaching you use two languages*

Mrs. Joshua: *yes*

Researcher: *English and Chichewa*

Mrs. Joshua: *yes*

Researcher: *ok, so if we consider your teaching experience and the languages that you have in your class, what is your assessment about the relationship between language and mathematics, do you see and relationship*

Mrs. Joshua: *yah its there, ah firstly there are some terms which are in English which is very hard to put that in Chichewa, to come up with words in Chichewa, so I think they even change the meaning so because, when, they should be in English but just for the sake of explaining further but at the same time there are some explanations which for the learners to understand you need to explain in, you can start with English but then explain further in Chichewa*

Researcher: *so it's like you switch*

Mrs. Joshua: *yah*
Researcher: *and in terms of relationship between language and mathematics in other words you use Chichewa to make clear the explanations*
Mrs. Joshua: *yah*
Researcher: *so how does this affect you in preparing these student mathematics teachers, like they are going to teach in multilingual classrooms and here you are preparing them to teach in those environments where they will use different languages like you are saying Chichewa or lomwe or Chitumbuka all the languages are there, so you are here knowing that these people or these students they are going to teach, how do you prepare them, how does that affect you, do you take these issues into consideration,*
Mrs. Joshua: *yah, of course that have an effect, ah I take that into consideration especially when doing micro teaching, when doing micro teaching if they are given lower classes like standard one to four they are supposed to do that in Chichewa,…unfortunately we just use Chichewa but to some other areas like Mulanje and the like learners are more conversant with may be ah lomwe and the like but may be because Chichewa is not far from lomwe, yah but otherwise yah, indeed it's a problem those that have gone to teach at lomwe institute, at least know some terms and then ah if the micro teaching were done in Lomwe and Sena I think that would be even better*
Researcher: *so they do the micro- teaching in English or Chichewa*
Mrs. Joshua: *yah English or Chichewa yah there are just two languages*
Researcher: *there are just two*
Mrs. Joshua: *yah*
Researcher: *so it's like, as you have said although its not …*
Mrs. Joshua: *yah but in case of micro teaching its there that when they are preparing for classes from one to four they have to do it in Chichewa and it's done by all*
Researcher: *ok so they do the micro - teaching in Chichewa*
Mrs. Joshua:
Researcher: *how do you know because you don't know who is going to teach from standard one to four,*
Mrs. Joshua: *yah*
Researcher: *and you don't know who is going to teach from standard five to eight*
Mrs. Joshua: *yes*
Researcher: *how do you do it*
Mrs. Joshua: *only that when you are preparing for that you just say group one prepare ah micro – teaching you are going to look at mathematics for standard one, here is the material may be next week or tomorrow you are going to practice, that's all, otherwise we don't know that, those people in that particular group are going to teach standard one or three or seven*
Researcher: *so when you say micro teaching what do you do, ah I mean do they go to teach in the primary classes or do they teach each other*
Mrs. Joshua: *yah there are two ways, ah either, firstly I should say they teach each other we give them may be ten minutes so the rest will be pupils and then we have discussion, but then there after like here second term they are supposed to go to demonstration school to teach pupils there*

Researcher: *ahha*
Mrs. Joshua: *yah and that particular individual student has been given to teach standard one to four he is supposed to prepare the lesson in Chichewa*
Researcher: *ummhu, so in other words we are talking of something like the language skills here, it's like they have to know how to teach in both English and Chichewa because they don't know*
Mrs. Joshua: *yes, yes*
Researcher: *which class they are going to teach, so how do you help them like to build these language skills*
Mrs. Joshua: *of course it's a problem especially like for myself, because I didn't do even Chichewa at form four, my MSCE*
Researcher: *owo*
Mrs. Joshua: *now yah I just did it at JCE, now (laughing) its like I start it here and I think it's a problem but still they get assistance from there friends here how can I do it and even the books themselves, because we have teachers guides and pupils books are written in Chichewa so, yah*
Researcher: *so do you have a specific lesson that this one is, or what do you look at when you are or when they are doing the micro – teaching. Do you look at the content that they are teaching or you look at the language skills how they are communicating or what do you look at*
Mrs. Joshua: *ok there are several things which we ok at ah and we don't look at everything at once because we have several micro – teachings, now and as I have already said is just for ten to fifteen minutes so its not possible to look at everything that so its like today you look at content, may be we have learnt about HCF, that is how can you introduce the concept of HCF, that is we just look at how the content is delivered, tomorrow you look at the learning and teaching resources, you have taught this topic, how can you, ah how can you, ah how can you ah do the micro teaching then you look at the teaching and learning resources which they have used for that particular lesson, the other day you look at the pacing ah the language and the like yah so yah (checking if the students have understood)*
Researcher: *ok, so the language is there*
Mrs. Joshua: *yes, yes*
Researcher: *when you are looking at how is he communication*
Mrs. Joshua: *yes, yes, yah*
Researcher: *so from your assessment, how do you go like the language issue, that is we are talking of language and the mathematics how do you look at it, is it a problem*
Mrs. Joshua: *yes language is a problem, because when they are using English, since English is not our mother language there are always problems, now some concepts, the way they are expressing its not necessarily the way they are supposed to be but because ah they don't have enough vocabulary and the like yah, I know when you go to Chichewa again, still because even our students they have learn it in English, now there are some terms like to put them in Chichewa along sentence (laughing) and when they are doing that they are supposed to use one language because when its English they are just supposed to use English only yah, that's what we look for, that if its standard five you are just supposed to use English if you use Chichewa and the like then ah*

Researcher: *loose marks*
Mrs. Joshua: *yah they lose marks for that and when they are doing it in lower classes it is supposed to be Chichewa only, now for them to explain it's like, so which ever (laughing), yah*
Researcher: *ummhu, so it's like it has to be one, ok so how do you help them now, in terms like the language, like to build their language skills*
Mrs. Joshua: *I should say may be in the languages department but for the mathematics (laughing),*
Researcher: *ummhu*
Mrs. Joshua: *no*
Researcher: *ok, so if we consider like, the primary mathematics classrooms which are multilingual, do you know or are there any challenges that these teachers meet when they to teach*
Mrs. Joshua: *mum, yes, because as I have already said ah in other classes yah of course English is ok but still I think it was a mixture because things its not only a problem to the learners but even to the teacher himself or herself, there are some other terms as I have already said or some other concepts to explain in as I have already said its not our mother language*
Researcher: *so apart from the issue of vocabulary, what other issues, or what other challenges do they meet, apart from say they don't have a Chichewa term for a specific word or they don't have enough vocabulary, what other challenges do they meet*
Mrs. Joshua: *other challenges I feel ah its because when we are talking of local language its only Chichewa but, … so again to the teachers as well as to the learners because like myself I still problems even though we say no they will be able to understand but still for myself teaching ah the standard one two, three fours ah in Chichewa I would still have problems, I should think it's the same with other, other, other ah teachers especially those who are not Chichewa, the Lomwes Chitumbukas, its as good as English when you are teaching in Chichewa is the same as you are teaching in English, yah, so it's the same to the learners yah, some learners who are not good at Chichewa they don't understand Chichewa properly, so I think …*
Researcher: *so, of course you have explained a little bit of about what you do here, may be if you can explain more on, if you consider this, when they go to primary schools there will be some students that will not be able to understand, do you do anything may be bearing that in mind, how do you help them to overcome these challenges*
Mrs. Joshua: *ah so far no, but then just like a solution to that ah for this college BTTC, majority of the people who come here are from the north and this part we have, ah Nsanje, ah Phalombe, and Thyolo, so majority its like Karonga its from so that someone from Mzimba can not be selected to come here and unless if it is a cross transfer*
Researcher: *ok*
Mrs. Joshua: *yah so I just think may be that looks into that area (laughing), the issue of language I just feel yah*
Researcher: *ok, so you are saying the issue of selection*
Mrs. Joshua: *yah, yah*
Researcher: *takes care of that problem*
Mrs. Joshua: *yah (laughing)*

Researcher: *for the language issue*
Mrs. Joshua: *Yah (laughing)*
Researcher: *ok, so in your teaching you don't*
Mrs. Joshua: *no, just Chichewa*
Researcher: *ok, so what is the main focus of your teaching is it on the content, or developing ….*
Mrs. Joshua: *ah I should say depends on the topic, there are some topics which are more content and if that is the case, then the main focus is on content, so that you aim at making sure that students understand this content, but then for some other topics ah its like the focus is on …how they should deliver the ah the content for the primary school, because the way the … is in such a way that we have a content part which is just solely that the teacher should be more knowledgeable and then there are some topics which are more on how they should gain the experience of how to prepare their lessons*
Researcher: *ok*
Mrs. Joshua: *and then ….*
Researcher: *ok you have from your explanation you have reminded me of the situation that, when they are doing the micro teaching if you know that like English may be not necessarily English but the language that they are using is like, do you like, or how do you help them. For example may be like English, someone is not fluent in English and cant communicate in English may be you cant really get what he is saying because of the problem of the language can be Chichewa or English, in that case how do you help them, or may be in the first place we should ask do you have those cases*
Mrs. Joshua: *yes there are those cases and many especially English, just a matter of saying may be just pointing at that mistake and saying this is supposed to be like that that's all but not going further saying that if there are these cases then ah no we just point them out so that they can correct them which is still feel its not enough because someone can again may be the same thing which is like that one but it wasn't a very clear explanation, yah*
Researcher: *so it's like if they are teaching standard five to eight content they have to do it in English, it's like it's strict*
Mrs. Joshua: *yes, yes, yah, whether you have problems and you can actually see that this one has got the material but the only problem is language yah*
Researcher: *ok so considering those challenges, now you are here you are preparing those teachers they have to go to teach in various schools, yourself, what are the language challenges that you meet. Taking in mind that your class is multilingual and taking into consideration that the teachers that you are preparing they are also going to teach in multilingual, and your class is also multilingual and both of you are not fluent say in English,*
Mrs. Joshua: *yes*
Researcher: *meaning that English is not your home language, what challenges do you meet*
Mrs. Joshua: *yah, of course there are challenges, ah especially in my case, mainly I prepare those ah learners to speak in English, I don't look much at like Chichewa so that's the main challenge and I feel it could be good if we had an inset or yah something like an inset or a workshop in which we I think not only in mathematics but even in other learning areas we can have at least a workshop so that we know these things and*

because we also just discover them by just reading in the books and the like but otherwise we have never learnt about that so we just teaching from the air (laughing), yah so that's the main challenge yah, because am not conversant as well with
Researcher: *so it's like you are forced to teach in English through out*
Mrs. Joshua: *yah because Chichewa sinanga ndi cha*
Researcher: *and you can't use Chitumbuka because the majority*
Mrs. Joshua: *they won't understand (laughing)*
Researcher: *yah they won't understand, ok, so how do you overcome these challenges*
Mrs. Joshua: *as I have already said it's through reading books for teacher's guides and reading books for the lower classes ….*
Researcher: *ah, now do you discuss these problems with your fellow mathematics teacher educatorss? Do you share the challenges?*
Mrs. Joshua: *yes, but mainly I should say at departmental level*
Researcher: *at departmental level*
Mrs. Joshua: *yah*
Researcher: *ok, when you have like meetings*
Mrs. Joshua: *yah, sometimes when we have meetings, sometimes when we are just chatting and we share, but mainly its not formal its so informal that somebody say I met this and oh it was not supposed to be like that, oh it was supposed to be like this, that's all but not necessary sitting down and saying here we have a problem how can we go about it,*
Researcher: *ok, so it's always informal*
Mrs. Joshua: *yah it's like its being neglected (laughing)*
Researcher: *eti, ok so what recommendations can you give for you like to be equipped to prepare the mathematics students teacher's languages practices, like to prepare these students to go and teach in multilingual classrooms*
Mrs. Joshua: *I think it should start with ourselves, ah we should be more trained, we should be more conversant with ah teaching especially Chichewa, because we have been trained just teaching in English and even the, the, the vocabulary some technical words which we use are just, like equations it's just English (speaking and laughing at the same time) but now to translate that to Chichewa, it becomes difficult so I still feel if we could have whether an inset or a workshop on which we ourselves should be equipped with that then after gaining that experience we can impart to the students, but at the same time I still feel just to … Chichewa, for the learners that is, I think still it's not enough, because there are some areas I tell you like the Chitipa there, Chichewa its like English, it just as good as English no difference (laughing),*
Researcher: *so in that case what do you suggest?*
Mrs. Joshua: *yah, I still feel that according to that particular area of course like may be the north we can say we look at lambya, we look at Khonde, we look at Chitumbuka, we look at, there are of course many languages but I still feel if they could consider Chitumbuka, at least majority can understand Chitumbuka like the north, dwell much on, of course some still some Chichewa but again and Chitumbuka … dwell much and again on the languages which are most common there are so many but there are others which are ….*
Researcher: *ok*

Mrs. Joshua: *(laughing) I feel that could assist other than dwelling on one language*
Researcher: *ummhu*
Mrs. Joshua: *others benefit but others still suffer*
Researcher: *yah, ok so it's like to others it's an advantage*
Mrs. Joshua: *yah while to others*
Researcher: *it's a disadvantage, oh ok so how does that affect your assessment, when you are assessing do you consider these language issues*
Mrs. Joshua: *unfortunately no, and I know others have been penalized because of this I still, the weakness that is still there they have to but it's because of these factors like language*
Researcher: *like for example, if they go for teaching practice, and may be they are teaching standard five, and the person is not fluent in English*
Mrs. Joshua: *yes*
Researcher: *and he can not deliver because of that, how do you consider that case*
Mrs. Joshua: *yah then he has... content no, not knowledgeable, the main issue is on our observation form it has areas that we look for, so there will be issues of content, ah vocabulary its there, since all those areas are penalized only not because that particular someone is not knowledgeable but because its not his home language*
Researcher: *ok, can I see the observation or evaluation forms that you use latter?*
Mrs. Joshua: *ah*
Researcher: *like the evaluation forms that you use when you go for teaching practice*
Mrs. Joshua: *ah I have to ask Mr. S. whether we have it now*
Researcher: *ok, yah if you van find out one for me*
Mrs. Joshua: *ok*
Researcher: *so now if we come to the Language-in-Education Policy, are you aware of the official languages that we have for primary schools,*
Mrs. Joshua: *I stand to be corrected; ah I know its Chichewa and English,*
Researcher: *ah am not very sure because what I think was like from standard one to standard four, they use their mother tongue language*
Mrs. Joshua: *yes*
Researcher: *is it mother tongue or Chichewa?*
Mrs. Joshua: *anyway, may to some particular teachers but with the books I should talk of the books*
Researcher: *eh*
Mrs. Joshua: *they are in Chichewa*
Researcher: *ok*
Mrs. Joshua: *from one to four*
Researcher: *but the Language-in-Education Policy, you don't know it, the official language for primary schools*
Mrs. Joshua: *no,*
Researcher: *ok, don't they give you those policies*
Mrs. Joshua: *ah, may be if there are some where but they haven't given to us, yah*
Researcher: *ok, so they don't circulate them, so it's like you just assume that because the books are in Chichewa, then the language for learning and teaching should be chichewa*
Mrs. Joshua: *yes (laughing), may be I should ask*

Researcher: *(laughing), ok, ok may you ask the head may be he knows*
Mrs. Joshua: *yah (laughing)*
Researcher: *now how do you teach if you don't know the language to be used?*
Mrs. Joshua: *as I have already said that because the books are written in Chichewa that is why we go for it*
Researcher: *yah*
Mrs. Joshua: *and we even encourage learners to (laughing) to teach in English from standard five to eight, and chichewa from standard one, I think when its teaching, anyway because I have already said that because I haven't seen that, but when we go for teaching practice again I should say may be because they don't have much experience, because last time we went to Blantyre so I again should I say that because its Chichewa we were just looking at Chichewa from standard one to four, and from five have English, that was all*
Researcher: *ummhu*
Mrs. Joshua: *yah and from five one was supposed to use English and Chichewa and then …*
Researcher: *ok so in other words we can say even the teachers themselves they don't know the Language-in-Education Policy, the teachers that you are training here,*
Mrs. Joshua: *yes, but may be we shouldn't conclude may be, because I haven't consulted with my friends (laughing) yah*
Researcher: *ok*
Mrs. Joshua: *may be after interviewing them*
Researcher: *may be they told them (laughing)*
Mrs. Joshua: *(laughing), yah*
Researcher: *ok, so in other words ok, may be I should ask, do you have any official language for teaching and learning here?*
Mrs. Joshua: *not necessarily, anyway, zinazi zikhala ngati za kuchipinda (in a low voice) (laughing)*
Researcher: *(laughing)*
Mrs. Joshua: *komabe not necessarily a policy but its supposed to be in English, because still its not our mother tongue language so you see some Chichewa coming in*
Researcher: *ok*
Mrs. Joshua: *yah, it should be English*
Researcher: *Is it on paper or you just assume as well,*
Mrs. Joshua: *yah just assume as well as I already said that, it's just an assumption that we use English yah, it could be there but*
Researcher: *ok, so ah now I wanted to ask you know like is there any link between the two official languages that's primary and here, so let me ask you have you heard anything of the use of mother tongue language in our primary schools?*
Mrs. Joshua: *yes*
Researcher: *so how has the college or department of teacher education or any other organizations helped you in developing your language skills in order to better equip these primary school teachers that you are training?*
Mrs. Joshua: *so far I cant remember, they haven't been any discussions on that I have just heard on the radio about the mother tongue but here no, we have not discussed about that, yah*

Researcher: *ok apart from the college any other organization?*
Mrs. Joshua: *we just discuss at Malawi Institute of Education, but it was unofficial yah so that there is need for even books for the mother tongue yah*
Researcher: *so even the workshops that you have attended there was no mention about that*
Mrs. Joshua: *no as I have already said its informal people just discussing in informal forums and share their experiences*
Researcher: *ok so what are you going to teach?*
Mrs. Joshua: *its fractions*
Researcher:

MR LUKHERE

Researcher: *I hope izipanga bwino bwino, ok I just to, just to repeat what I said last time its am looking at basically three areas, am looking at, the first area is about the issue of Language-in-Education Policy. Ah the second area is about the issue of dilemmas, of the problems in primary mathematics classrooms, that is the problems that mathematics teachers meet in primary mathematics classrooms. And then the third area is about the issue of language and mathematics, how do you balance the two, the problems or the challenges that you meet so basically it's like these interviews we are looking into these areas.*

Mr. Lukhere: *ok*

Researcher: *Am looking at multilingual classroom, may be before I explain to you like, like in my case, and may be I can just ask you something if you know about something about multilingual classroom just your explanation. What do you understand by multilingual classroom so that when we go on we should have the same definition or we shall be talking of the same?*

Mr. Lukhere: *same language*

Researcher: *same language, yah*

Mr. Lukhere: *multilingual classroom may be should refer to a classroom where the combination of students is that, ah which those students they speak different languages.*

Researcher: *yah, ok like can have the combination of more than two*

Mr. Lukhere: *yah more than two*

Researcher: *yah, if they are two languages may be we call it bilingual if we have two languages*

Mr. Lukhere: *ok*

Researcher: *so like the context that we are talking about is where more than two languages are used*

Mr. Lukhere: *ok*

Researcher: *so may be from your definition, how would you classify your classroom?*

Mr. Lukhere: *it is multilingual*

Researcher: *it's multilingual. Ok, so if we consider your teaching experience and the languages that you have in your class what is your assessment of the relationship between the language and between the language and the mathematics, or there is no link. That is from your teaching experience from the years that you have taught, you can even start from your secondary school experience, how do you see it, is there any relationship,*

Mr. Lukhere: *ummhu*

Researcher: *we can say kuti ummhu like language, language ya mclass ija does it have any effect on the teaching of mathematics, what impact does it have or it doesn't have any impact, any language whether its English or any home language whether its Chichewa or whatever is there any relationship or it doesn't matter what language you use*

Mr. Lukhere: *ah I think on this one I have not really thought deeply about it, because in most cases when we are teaching mathematics we use English despite the fact that students are multilingual and if we are to go into one of the local languages then it has always been Chichewa and none other than Chichewa therefore may be to link other*

languages Chilomwe Chiyao Chitumbuka we need further teaching of mathematics, ah we have not yet thought about in, yah because when it comes to mathematics if it is not English then its Chichewa, and Chichewa comes in because from standard one to standard four, teachers are supposed to use their local languages but in this case we use chichewa

Researcher: *ok, so like considering Chichewacho how do you assess like the relationship does it have any relationship with the teaching of mathematics, when you teach in Chichewa or is there any relationship it can be English or Chichewa*

Mr. Lukhere: *ummhu there should be I should say there is a relationship in the sense that since in standard one and two pupils are taught in Chichewa and not in English that is to say if pupils are taught in English they will not be able to understand, but if they are taught in Chichewa … other courses but therefore an understanding of Chichewa on the part of teachers in the teaching of mathematics is important because without that communication is going to be a problem. So this person or this teacher is supposed to know in Chichewa because when the teacher plan his lesson plan it is a must that the lesson plan must be in English but when it comes to communication in a classroom with the pupils, it has to be in Chichewa, so its like a teacher interprets what has been written in English into a local language,*

Researcher: *ok*

Mr. Lukhere: *yah*

Researcher: *so even the lessons they are being prepared in English*

Mr. Lukhere: *yes*

Researcher: *ok*

Mr. Lukhere: *it has to be English, because even the schemes of work, they have to be in English*

Researcher: *Even schemes of work, the teachers guide*

Mr. Lukhere: *yah, ok for the pupil's book it's*

Researcher: *in Chichewa*

Mr. Lukhere: *in Chichewa, yah but the teachers guide is in English*

Researcher: *ok, so it's like all the material that they are using its in English*

Mr. Lukhere: *yes*

Researcher: *so it's like they prepare everything in English*

Mr. Lukhere: *that's right,*

Researcher: *and then teach in chichewa*

Mr. Lukhere: *so the pupil's book, the pupils' book it's in Chichewa*

Researcher: *ok*

Mr. Lukhere: *ndithu let me just show you one of the copies, am not sure standard two books,*

Researcher: *up to standard four*

Mr. Lukhere: *most of the books have been borrowed by the students*

Researcher: *ok,*

Mr. Lukhere: *(searching for the books), (inaudible)*

Researcher: *can I get them and bring them tomorrow so that I can go through them*

Mr. Lukhere: *ok*

Researcher: *(inaudible)*

Mr. Lukhere: *I have ummhu standard one, two of them at home. I will bring them tomorrow*

Researcher: *ok, so like considering this how does it affect you in preparing these teachers, the teachers guide are in English, but they have to teach in Chichewa. At the same time you don't know who is going to teach in standard one to four and who is going to teach in standard five to eight. Its like is mixed some will go to the junior some will go to the upper, how does this affect you in preparing them, and bearing in mind that these teachers they are also multilingual its not that there is only Chichewa*

Mr. Lukhere: *… it has an effect in the delivery of the lessons that is I will start with the teachers in the field, because ah for instance ah my mother tongue is Chitumbuka, and those books are written, pupils books are written in Chichewa and assuming one, one teacher whose mother tongue is Chitumbuka is posted to teach in a, at a very rural school, primary school, where the local language is, has nothing to do with Chichewa, so what it means is the teacher their probably has to teach in that local language, now suppose one has been posted to Nsanje where sena is major language and the teacher does not know sena and has been given standard one, there we expect lots of problems. Because the pupils do not know Chichewa, and the teacher may be does not know Chisena and he can not use English at the same time so in that case problems can arise that's what I can say and for us here unnhu we just make general preparations for, there is no specialization and as to the grade or the classes that the student teachers are going to teach is just general preparation for standard one up to standard eight and as regards to classes that is for standard one up to four, we still more use English in teaching the student teachers in how they can introduce some of the topics which are in those classes. However when it comes to practicing they are supposed to, they are in a classroom situation the teacher is supposed to peer teach a certain topic that applies to may be standard two or three may be four, the normal practice is, that student is supposed to use Chichewa and for purposes of peer teaching ah the same applies to teaching practice, the teaching practice which normally happens at the demonstration school, if the student teachers are teaching standard one to four has to use Chichewa and for standard five to eight it has to be English. That's all that I can say*

Researcher: *so like when you are in your class, when you are teaching, which language do you use*

Mr. Lukhere: *English*

Researcher: *do you like switch*

Mr. Lukhere: *we use English, however in circumstances where the topic under discussion it's supposed to be taught may be in the infant then may be standard one to four, then we normally switch we don't necessarily concentrate on Chichewa, we teach in English, but use some of the words in Chichewa.*

Researcher: *ok, like*

Mr. Lukhere: *like kuokhetsa, may be two plus three is equal to five, eh then we could say zithu ziwiri kuphatikiza zithu zitatu zikhala what, then zikhala zithu zisanu, so equals is zikhala, so we use may be words like these*

Researcher: *ok, so Chichewa comes in, in the issues of technical words or*

Mr. Lukhere: *that's right*

Researcher: *so it's like now you are preparing these student teachers somehow there must be a language skill*
Mr. Lukhere: *that's right*
Researcher: *they should be able to deliver the material that from the discussions that we have I think there must be a language skill somehow, how do you reinforce these language skills in the student teachers when you are preparing them, they have to I don't know but may be they have to be able to communicate the mathematical concepts to the students they have to use language, whether its their home language or they have to use English but they have to use English to communicate, do you have anything to reinforce these language skills, because without communication there will be no learning and no teaching so at least there must be a skill somehow for communication, how do you reinforce this. And the language that I mean the language like English that is used for normal communication in class, the normal communication and it might not be necessarily that it should be in your lesson plan that this is how I teach the skills, but may be just to help them that they will be able to communicate properly wherever they go.*
Mr. Lukhere: *of course one of the ways is through micro teaching, because the micro teaching what normally happens is when a student teacher ah may be peer teaches others observe may be at the end observations are made and comments are made and sometimes in a classroom situation where a certain word is in English and that word or term applies to the lower classes in primary school, like I normally put a deliberate question to the class as to how such terms can be interpreted in Chichewa. And of course sometimes variations come, variations come from the pupils same word can be interpreted differently but those interpretations are normally correct except that different words ….and that is what I would say (laughing)*
Researcher: *so it's like when they are doing micro teaching they have to, or it's like they are teaching the standard one student they have to teach in Chichewa*
Mr. Lukhere: *that's right*
Researcher: *and that from standard five to eight they have to teach in English*
Mr. Lukhere: *that's right*
Researcher: *do you have like the normal lessons where you would teach in Chichewa*
Mr. Lukhere: *no, there is no special lesson in Chichewa*
Researcher: *ok, so how do they do it*
Mr. Lukhere: *I think they find it easier because in Malawi Chichewa is more less like a national language though constitutionally, I don't know whether constitutionally is national language, am not too sure, but most of our students are able to speak Chichewa because it has been perceived as a national language for quite a long time, now and because of that background ah we have very few problems as regards to Chichewa, that is for this group from the south, but I can not tell to what is happening in the North about that problem, there is much difference*
Researcher: ok, the assumption is that if we train them in English its easy for them to translate it to Chichewa
Mr. Lukhere: *yes*
Researcher: *it's like*
Mr. Lukhere: *not necessarily, not necessarily preparing lessons in Chichewa, but communicating to the pupils in Chichewa*

Researcher: *ok, do you have any other, like say apart from the micro teaching do you have any other activities that they do?*

Mr. Lukhere: *yah in Chichewa or their local language*

Researcher: *yah or just any language that they use whether it's English*

Mr. Lukhere: *of course the other way is through the written tests, examinations are always in English and sometimes we have, that is for teacher training colleges in Mathematics, we could have, we can have exams that would require people to say things in English, not solving the problem but explaining in word form may be how we can introduce equivalent fractions, that is to explain those items in English. So in that case when one is going through that work, one have to check the students language and of course during the interaction in class, sometimes we have cases where students are not able to express themselves properly, they are …. If ah a grammatical error is made, you can make corrections but we don't necessarily emphasize on those issues, our emphasis is on mathematics.*

Researcher: *ok, so it's like even for the students in your class, are they or do you allow them to use both English and Chichewa or you are strict with them that use English*

Mr. Lukhere: *am not strict (to say English only), ah I have cases where students have explained items in Chichewa so am not very strict, just because I know that they are not supposed to use Chichewa …. And they know that*

Researcher: *ok, so if we consider like ah your experience you taught at secondary school and now you are teaching here ummmhu do you know may be any challenges that the mathematics teachers more especially like in secondary schools meet, the language challenges that, the language challenges that they meet apart from you talked something like the might go to a place where themselves they speak a different local language from the learners. Is there but I want to talk about if you know any other challenges that the mathematics teachers meet when they go for the actual teaching, the language challenges*

Mr. Lukhere: *of course, I don't know whether this have been highlighted the other problem could be with the teacher themselves in trying to interpret the lesson plan to, ah the lesson that is written in English, to the local language of that particular setting, I think that, that could be a problem, because we can talk of ah place value boxes and … these are English terms and how can one use place value box trying to add, trying to add whole numbers involving regrouping so to interpret those things in Chichewa may be, might be a problem they could start with, simply because we have books which are written in Chichewa then it can give … problem*

Researcher: *so like now coming to you here at TTC, what are the language that you meet in your classroom, considering that your students English is not their home language and they also speak different languages and yourself you have a different local language from the students, do you meet any language problems or language challenges because of that*

Mr. Lukhere: *no, not really because as I said earlier on that when it comes to teaching we use English and in some cases Chichewa and because of the exception that most students know Chichewa simply because Chichewa has been accepted as a national language (laughing), I think I don't have any problems, yah I should say we don't have problems*

Researcher: *so like ummhu, for example like the issue of interpretation you have words or terms that may be you don't know say in the local language, so that means it can not be translated into a local language, how do you deal with these issues? But also it might be like the students themselves may be they are not understanding you because of the problem say English may be they cant hear you they cant understand whatever you are teaching because of the language, in that case, or do you meet such cases? And how do you handle them?*

Mr. Lukhere: *ah I think this one is difficult to explain in the sense that you may have, they may communicate the content to the students and its up to students to deduce (students responsibility in class) whether they have understood or not but that will only be displayed or it will only be known to me after giving them an exam to how era they going to perform and when they are doing the assignments or doing the end of term exam and if … in that student has failed, so it is the question of guessing as to whether ah this performance was due to language problem or other problems.*

Researcher: *ok so like if you have those cases like for example you have that exam someone has failed and you are not very sure whether its language or do you have any, any ah do you investigate further to check how one has failed, do you share it with friends, how do you solve it?*

Mr. Lukhere: *we normally do revisions but as I have said it is difficult to tell whether that … must be due to the issue of language, so I don't investigate about the language and of course sometimes in a classroom situation where a student has not understood as long as they have …the issue that they have not understood and I feel like I should …, we do those repetitions, I do those repetitions but where necessary then I go to local language just to try … especially if that issue has something to do with the lower classes*

Researcher: *ok, ummhu so its like what recommendations can you give like for you may be to be more equipped on how to train these primary teachers so that when they go to teach in the multilingual classrooms they will be, so we were saying any recommendations for you to be in a better position to prepare the student teachers, that is for you training now,*

Mr. Lukhere: *laughing, ummhu, ah am not to believe that lower classes where Chichewa or the local languages have been practiced, or have been used in teaching it's not yet a long term issue I think it is still in the should we say ah I don't know should I say it's going to be there for good or it's just going to be there for just quite some time and depending on whatever the ministry says it's going to be extended to other classes ah something like up to standard eight am not very sure because I remember a long time ago all the books were in English, the standard one books and two were in English, now of it occurs that may be local language, the use of local language is going to be extended up to upper classes then definitely there is need even for mathematics teacher educators to be equipped in those areas and it's not only that it means there is need for, there is need for the ministry to produce books in various languages and the need for teachers to be trained using those various languages which is going to be very, very costly for the government so that's what I would say*

Researcher: *so like on what we have discussed ummhu, you are aware for the Language-in-Education Policy for the primary school*

Mr. Lukhere: *yah, the policy is from standard one to standard four eh teaching is supposed to be in the local languages that is however, yah teaching is supposed to be in the local language and from standard one to four teaching book, pupils books are written in Chichewa but, but teachers guides are written in English*
Researcher: *so the issue of local language, is it the local language of the teacher or the local language of the pupils*
Mr. Lukhere: *ah, for that one, am not very sure because*
Researcher: *because what I wanted to do is, I wanted to check if the Language-in-Education Policy at primary level and the Language-in-Education Policy here, or may be before I go there do you have an official local language for the TTC*
Mr. Lukhere: *I think*
Researcher: *so they just tell you that you use English or you just assume that it should be English, did they brief you or*
Mr. Lukhere: *I think we were supposed to be briefed ah let me say that there could be a policy, eh there could be a policy to say ah from standard one to four communication should be in Chichewa and five to eight English, but so far I have not seen one,*
Researcher: *so here you use English*
Mr. Lukhere: *and Chichewa*
Researcher: *and Chichewa*
Mr. Lukhere: *that's right*
Researcher: *you have seen it from the books not necessarily that have seen anything on the policy about the language of teaching and learning at primary school and here*
Mr. Lukhere: *no, I have not seen any*
Researcher: *so when you came here you were just given your things and your class and you go and teach based on the language used in the books*
Mr. Lukhere: *that's right, I teach basing on the language of the book, and Chichewa comes in as it has been put in the policy that standards one to four pupils are supposed to be taught in Chichewa but I have not personally seen the policy*
Researcher: *so the next question that I wanted to ask is, is there any link because I thought that you are given the policies about the language for teaching and learning for primary school and here, so I wanted to check if there is a link between the two*
Mr. Lukhere: *may be if I can investigate further as to whether the colleges have ah a document on the language of learning and teaching may be to check if English is the official language or its English and Chichewa*
Researcher: ok, so since you came here it is like you have been using one language, with the slots of Chichewa here and there.
Mr. Lukhere: *yes*
Researcher: *is there any thing that the college or the department of teacher education or any other organizations just to support you in terms of language not language as in a subject but language as in communication in the mathematics teaching*
Mr. Lukhere: *no I have never attended one, what I said earlier on that there is what is normally called the in-service training, you appreciate that secondary school teaching, teaching at secondary school and teaching at TTC is different, as with my case it was simply … where one is briefed and what is expected at TTC, but not necessarily a special programme that can attract the …as a matter of fact in Malawi we have had no special college to train mathematics teacher educators, most of the mathematics teacher*

educators we have, have been trained as secondary school teachers and the only group that was trained if I can remember that was specifically to teach in TTCs was in 1987 where some serving mathematics teacher educators, T2 serving mathematics teacher educators were taken to chancellor college for a programme in education, the most recent one where mathematics teacher educators have been trained were, were, were they were trained to teach in TTCs was the programme that was introduced in 2003, yah there is a degree programme in primary education, that's the most recent one, otherwise the most of the group most of the mathematics teacher educators at TTC either they were trained at Chancellor college as secondary school teachers or they trained with US, we call it Rockland college where they got trained in degree in primary education apart from that then we have some of the mathematics teacher educators who hold some diplomas from chancellor college some twenty nineteen years ago, and those ah that group they picked the group which was teaching ah at teachers training colleges and went for upgrading I think that went on especially for mathematics teacher educators,

Researcher: *so its like if you want to upgrade it's your own effort*

Mr. Lukhere: *ah, when one want to upgrade ah I would say, ah I would say in two aspects, ah four years ago I think there was a partnership between the Ministry of education and a certain college in US where a good number of mathematics teacher educators were trained that is they were trained for a two year masters programme for primary education but unfortunately, that, it was the only programme for a postgraduate certificate that is in primary education and after that , the … has been that ah the Virginia tech got disappointed I think after they acquired the masters degrees most of them left teachers training colleges as am talking now some are with the University of Malawi – Chancellor college, other are with Domasi college of Education, others have joined Mzuzu University, others have joined other different organizations only because of package so if one want to upgrade now then it has to be a personal initiative , I know few serving ah, I think I know two serving mathematics teacher educators who went for masters in primary education at chancellor college and there was one again at KATTC who went for masters in 2005, so if I have to go for the masters programme of course the normal procedure is to go through the ministry of education to apply through the ministry of education in most cases the answer is there is no funding of such programmes so people give up*

Researcher: *ok, so I think that's all that I had but may be I just want to know what you are going to teach*

Mr. Lukhere: *am teaching on equivalent of fractions, I introduced fractions on Friday where we were doing the finding fractions how to name fractions, and how to write fractions so today is the continuation but we are looking at equivalent fractions that is to say of course.. . From known to unknown so that they too can …..*

Researcher: *ok so it's like more of the middle of the topic*

Mr. Lukhere: *that's right*

Researcher: *ok and then may be just in brief, what challenges can you for see that you are going to meet when teaching this section*

Mr. Lukhere: *ah, its difficult to say because in primary schools equivalent fractions are taught in standard five, and standard five the mode of communication is supposed to be English, so if it were something to do with standard four or standard three class*

then definitely we were going to face some problems, and of course I should not rule out because even in English language it's a problem on its own

Researcher: *ok, may be before we can close, may be if there is anything to add that we didn't but may be you feel that it might be related to the issue of language and mathematics*

Mr. Lukhere: *ah, no, not really*

Researcher: *ok,*

Mr. Lukhere: *there might be some issues arising I might tell you as we go on*

Researcher: *ok thanks very much for your time that you accepted to be interviewed*

Mr. Lukhere: *thanks no problem*

Researcher: *thank you very much*

Mr. Lukhere: *you are welcome.*

MR CHIPASULA

Researcher: *It's about language and Mathematics*
Mr. Chipasula: *Ok*
Researcher: *Of course am doing, ah, ndimaphunzitsa (I teach) mathematics ku (at) polytechnic*
Mr. Chipasula: *Yah*
Researcher: *Komano project imene ndikupangayi ndiyoti (but the project that am doing concerns about), I want to check kuti (that), the relationship between the mathematics, the language that we use and the mathematics, mainly that's what I want to look at, komanso (also) I want to find out like the language challenges that maziphunzitsi aku (mathematics teacher educatorss at) TTC amakumana nawo, what are they and ngati alipo machallenges amene anjawo ah what, I mean what are you recommendations kuti pamapeto pake things can be done eh then apart from that I just also want to find out how you prepare the mathematics teachers its like may be like the challenges that you meet here, likely, or most likely they are the same challenges that they are going to meet*
Mr. Chipasula: *that's right*
Researcher: *ah, so its like, how do you solve the …, these problems and then how do you train these people considering may be the challenges that you meet so that when they go to their various schools they should be able to face the challenges that's what am looking for, yah*
Mr. Chipasula:*Researcher: ok so, of course also partly we will also discuss about the Language-in-Education Policy here and at primary school,*
Mr. Chipasula: *primary school*
Researcher: *yah, ndithu, ndiyeno, the project, mainly am looking at the context of multilingual,*
Mr. Chipasula: *ok*
Researcher: *classroom*
Mr. Chipasula: *yah*
Researcher: *so may be tisanapitilire I just want to have the same, when we say multilingual we should say the same ujeni eti? Ngati like, we should be on the same ground*
Mr. Chipasula: *yah*
Researcher: *ok so my first question is , like may be I just want to find out your understanding about a multilingual classroom*
Mr. Chipasula: *multilingual classroom*
Researcher: *yah*
Mr. Chipasula: *multilingual classroom is a classroom where by we use two or more languages*
Researcher: *oh, ok,*
Mr. Chipasula: *yah*
Researcher: *so if we consider your definition about a multilingual classroom, can we say that, or is your class multilingual?*
Mr. Chipasula: *yes it's multilingual in the sense that our, sometimes, our students fail to express themselves, so they are free to use Chichewa*
Researcher: *ohwo*

Mr. Chipasula: *Because they will use Chichewa when teaching*
Researcher: *ok*
Mr. Chipasula: *yah*
Researcher: *so what about like may be like Chitumbuka, you said most students are Chichewa and Chitumbuka, I don't know, are they allowed to use Chitumbuka*
Mr. Chipasula: *laughing sometimes they, when they fail to express or to say anything in Chichewa they speak Chitumbuka but not to that extent*
Researcher: *uhmmhu ok*
Mr. Chipasula: *may be they know that many of us don't understand Chitumbuka*
Researcher: *ok, now*
Mr. Chipasula: *but when you ask them to discuss in groups you can here some Chitumbukas*
Researcher: *ummhu*
Mr. Chipasula: *some chichewas yah*
Researcher: *ok, ok so it's like if we consider like your experience, this is your eleventh year of teaching experience and the languages that you have like in your classroom, what is your assessment between the relationships, or what is your assessment relationship about between language and mathematics*
Mr. Chipasula: *yah , sometimes I think our students I think fail may be during examinations, tests or sometimes even class exercises, just because they know something in their local language but they fail may be to communicate in English so sometimes it has an impact*
Researcher: *ummhu*
Mr. Chipasula: *but since we allow them to use any so I think that freedom make them to be free*
Researcher: *ehh*
Mr. Chipasula: *yah to use there local language*
Researcher: *so it's like you are not very strict in your classroom*
Mr. Chipasula: *ah, no*
Researcher: *like English*
Mr. Chipasula: *yah*
Researcher: *ok*
Mr. Chipasula: *sometimes we may say try to express in English for the sake of examinations*
Researcher: *ummhu*
Mr. Chipasula: *but for classroom understanding, ah no, we allow them to use any*
Researcher: *so when do you mainly use these local languages?*
Mr. Chipasula: *mainly we use Chichewa when we are; I think as I have already said when we are discussing something about primary school teaching yah*
Researcher: *oh ok*
Mr. Chipasula: *yah, for example we say, how can we introduce addition in standard one,*
Researcher: *oh woo*
Mr. Chipasula: *one can expect, express in English, but we say but you will use Chichewa when teaching, can you try to express in Chichewa*

Researcher: *ummhu*
Mr. Chipasula: *yah*
Researcher: *ok, ah now considering like ah this relationship kuti ena ama that you sometimes switch*
Mr. Chipasula: *yah*
Researcher: *between Chichewa and English does that have any effect in your teaching?*
Mr. Chipasula: *yah, sometimes because of this switching we some students feel free to participate, because you can see when we are strict to say no explain in English one fails to explain but when we say can you explain in Chichewa, find out he or she is able to explain*
Researcher: *ok, so like when you are in your classroom what are the challenges, like the language challenges that you meet now when say you are teaching and then you have this issue of language of whatever do you have any challenges or difficulties*
Mr. Chipasula: *the main challenge is the Chitumbuka because this group the majority is from Mzimba south that's one of the challenges laughing I can't*
Researcher: *yah you cant speak Chitumbuka*
Mr. Chipasula: *yah I can't speak Chitumbuka, and the other challenge is that our curriculum since its exam oriented,*
Researcher: *ummhu*
Mr. Chipasula: *we try as much as possible to run away from these local languages write in Chitumbuka or Chichewa and the examiners, the one who will be marking will say ah know this is English grade so that's another challenge when you are trying to compare the understanding of students in the classroom and the performance at national level*
Researcher: *unnhu*
Mr. Chipasula: *yah*
Researcher: *ok, so like if you, if you have like student who is failing to express himself, for example let's take a Chitumbuka student*
Mr. Chipasula: *yah*
Researcher: *in your class, is failing to express himself in English or in Chichewa, do you have any ways of how to assist*
Mr. Chipasula: *ummhu yah sometimes I just try to break down the question may be to start with the pre requisite to the question*
Researcher: *ah*
Mr. Chipasula: *prerequisite knowledge, sometimes, because in my class I encourage everybody to answer my question*
Researcher: *ummhu, ok*
Mr. Chipasula: *yah because when that when ask somebody a question find that we point somebody to answer he or she just remain silent … we try to proceed at least if you don't know you say i don't know*
Researcher: *eh*
Mr. Chipasula: *instead of just remaining silent*
Researcher: *silent*
Mr. Chipasula: *yah*
Researcher: *ok ah*

Mr. Chipasula: *so if sometimes one says I don't know and I know that at least we covered that one I ask another question laughing, what about this question yah*
Researcher: *ok, so it's like you want to make sure that at least everybody speaks*
Mr. Chipasula: *yah*
Researcher: *in the class, ok, ah then anyway, the other thing that I wanted to find out is do you discuss like the problems, the challenges that you meet in class, and do you discuss them with your friends whether formally or informally or may be at departmental level*
Mr. Chipasula: *at I think at departmental level informally sometimes yah like coz we are four teaching mathematics so sometimes we say what are you facing in your class, so we share*
Researcher: *do you sharenso like, like how you can overcome*
Mr. Chipasula: *sometimes yes, sometimes no, sometimes we just say please take note of these problems, that's all*
Researcher: *ok, ah, I don't know, I just wanted to find out if you have like, if you know like any issues or any difficulties or any challenges that these primary teachers face when they go may to, to teach in their various schools, I don't know if you have any idea about that.*
Mr. Chipasula: *with the MITTEP group because they were starting with an orientation of two weeks and they go into schools to teach so they paired with the head teacher give them or share their experiences with them, and when they come back here it was difficult to switch the normal which was not correct lets do it in this way and sometimes they we can see that they have changed but when we send them back they switch back to there, but with this group since we have not started them how they are doing I don't know how they will fare, and another thing when we are discussing how to teach with MITTEP it was ok because they had experience of teaching but sometimes with this group, if we say can you guess how we can introduce this one, they have now idea they learned that one may be ten years ago, and it's a mixture some are young just about two years ago, they wrote MSCE, others its about ten years ago so sometimes its difficult*
Researcher: *ok, so like, so like the challenges in terms of language when they go to primary school and they are teaching in primary school, do you know may be any problems*
Mr. Chipasula: *yah because Kasungu north its Chitumbuka speaking area so sometimes when you send Chewas there they face problems*
Researcher: *ummhu*
Mr. Chipasula: *yah, pupils, children don't understand Chichewa, so sometimes they fail to give instructions, similarly those that are coming deep north like Mzimba south, in the rural areas they also face language problems when they teach in the Kasungu south or the other areas of central region*
Researcher: *ok now how do solve these, or how do you sort them out?*
Mr. Chipasula: *just encourage them to (laughing) to get used or try yah at least to learn some Chitumbuka and give some instructions where necessary in Chitumbuka*
Researcher: *ok now if we have say somebody who is teaching say from standard five to standard eight is in class and then he faces this language issue like may be the*

students cant get English and cant get may be Chichewa how do you help these people when they confront this that type of challenge?

Mr. Chipasula: *I think this problem sometimes becomes a nation problem because of the I think policy, some of us emphasize no this is standard six don't use local language, while others we know that I think our sciences, mathematics and sciences face problems because of language so when a teacher is using an instruction in local language I think we understand the problem*

Researcher: *so, ok at teaching practice, for example you are have gone to supervise somebody now he is in the situation where the students cant understand the English may be because of its not there home language and then in that situation may you yourself you know the problem, how would you assist*

Mr. Chipasula: *we advise them to give some instructions in English and some in their local languages so that they can understand what to do but not the language , the whole lesson in local language, so sometimes they may use too much Chichewa, or too much Chitumbuka*

Researcher: *so, it's like they feel comfortable they can switch sometimes*

Mr. Chipasula: *yes*

Researcher: *ah ok, ah what else did I want to find out, oh ok the other thing that I wanted to find out is the Language-in-Education Policy, anyway I get different versions anyway from different people, I just wanted to find out like what is the language may the policy, what does the policy say about the language to be used at primary school?*

Mr. Chipasula: *the policy is from std one to std four its local, its Chichewa not necessary local language, because if you are in Chitumbuka speaking area you are supposed to teach in Chichewa,*

Researcher: *ohwoo*

Mr. Chipasula: *yah that's the policy*

Researcher: *ok*

Mr. Chipasula: *in standard five we mix Chichewa and English, it's in English but since they are just coming from standard four yah they are allowed to mix with Chichewa.*

Researcher: *ummhu*

Mr. Chipasula: *while in six, seven, eight, strictly English, unless if it's a Chichewa lesson*

Researcher: *ohoo*

Mr. Chipasula: *so those I think its still going on, the project they are calling it what LAC, language across curriculum, so when we are attend maths Invent programme in Mangochi last year we had a chance to go to malindi and observe a lesson in yao laughing*

Researcher: *ohwo, how was it*

Mr. Chipasula: *ah it was ok*

Researcher: *laughing, would you support it*

Mr. Chipasula: *umhhu, yah only that I think I feel it has one problem when a teacher is posted to another area or when you are working with other departments and you have been posted to another area so your children will face problem but at the same time*

Researcher: *but otherwise*

Mr. Chipasula: *yah otherwise*
Researcher: *it was ok*
Mr. Chipasula: *yah*
Researcher: *where are they implementing this project is it in mangochi only*
Mr. Chipasula: *no, its has one in mangochi, deep malindi, as if you are going to Mozambique, then another one in Mzimba deep in Chitumbuka speaking area, and I think another one in is it Notched or somewhere, where its Chichewa speaking area*
Researcher: *so it's like they have three areas*
Mr. Chipasula:*yes*
Researcher: *so its like this issue of local language that we here its not yet implemented*
Mr. Chipasula: *no*
Researcher: *it's just*
Mr. Chipasula: *it's just the project to see how, but I think they are meeting very big opposition*
Researcher: *ummhu*
Mr. Chipasula: *yah, the nation is saying no to that*
Researcher: *ummhu, so if like, if we consider that situation what impact will it have at TTC level now because these people, they are like combined, you don't know who is going to teach standard one, you don't know who is going to teach in standard four, some will be given standard eight, yet here they are combined*
Mr. Chipasula: *yes, we combine here, so that's another problem,*
Researcher: *how do you balance?*
Mr. Chipasula: *we balance just by covering sometimes topics from standard one, sometimes we sample topics from standard three four then five, six sometimes from standard eight*
Researcher: *ummhu*
Mr. Chipasula: *yah*
Researcher: *so for the topics for standard one, two, three and four do you teach in Chichewa here? Or*
Mr. Chipasula: *we discuss in English but sometimes when we say now what is the actual teaching here then we switch to Chichewa*
Researcher: *so when teaching you are teaching them*
Mr. Chipasula: *ummhu*
Researcher: *you use English*
Mr. Chipasula: *yes*
Researcher: *but now when it comes to like practicing*
Mr. Chipasula:*yes*
Researcher: *practicing*
Mr. Chipasula: *ehe, like peer teaching*
Researcher: *ehe*
Mr. Chipasula: *yah that's when we use Chichewa*
Researcher: *ohwo*
Mr. Chipasula: *since sometimes we ask our students to demonstrate how they can do it*

Researcher: *but in don't you think, anyway not don't you think, but from your experience are there no problems like you teach them, I don't know how you teach them anyway, but anyway, suppose that you have a topic for example like fraction,*
Mr. Chipasula: *yah*
Researcher: *and then you teach them about fractions just teaching of fractions,*
Mr. Chipasula: *yah*
Researcher: *you have taught it in English*
Mr. Chipasula: *in English yah*
Researcher: *in English and now I saw the syllabus like fractions like saying add six one tenth plus*
Mr. Chipasula: *yah*
Researcher: *something like that, so it's the sum that they already know*
Mr. Chipasula: *yes*
Researcher: *so it's like when you are, how do you teach because it's the stuff that they already know so how do you teach and then laughing*
Mr. Chipasula: *in most cases since I know that I have covered may be in primary school or JCE syllabus the sometimes just ask them to discuss and when they are reporting we see that others I think although they have gone through primary but they can hardly even add fraction*
Researcher: *umhuu*
Mr. Chipasula: *just adding*
Researcher: *so it's like you have to teach them again*
Mr. Chipasula: *yah so sometimes we explain to them that no here you have to do this, you have to do this*
Researcher: *and after that you teach how*
Mr. Chipasula: *yah how to teach*
Researcher: *so that part that's what you teach in chichewa*
Mr. Chipasula: *yah it's Chichewa, but sometimes, sometimes it's still in English*
Researcher: *so don't you think that may be in there delivery face any problems in the sense that the way I look at it you have introduced the subject or what ever in English*
Mr. Chipasula:*in English and we say go and teach in Chichewa there is a really problem just because in just like … or translating other terms we have no Chichewa terminology, so sometimes its very big problem, for example to differentiate addition and subtraction, we say ina ndi kuokhetsa ina ndi kuchulukitsa yah*
Researcher: *what's the difference, ohhh ok I also wanted to find out if there is any, if you have any official language here the official language for teaching*
Mr. Chipasula: *ahh not necessary here but just... the official language is English*
Researcher: ok, because I was thinking that may be because the teachers that you are training some they are going to teach like standard one to four and others standard five to eight and in primary schools there is these two languages so I was thinking that, may be there is a link here you have two languages so
Mr. Chipasula: *here its one*
Researcher: *its, is there any link*
Mr. Chipasula: *no any link, I think the idea of emphasizing in English its because if we just say we group them saying this group is for standard one this is for senior*

classes they will face problems in the field so we train them to teach standard one up to eight

Researcher: *ummhu*

Mr. Chipasula: *yah*

Researcher:*ok, ah now like in your teaching, how do you help these teachers like to develop their language skills, I don't know I was thinking like may be to communicate the mathematics, to deliver the mathematics there must be something like some skills the language skills that is, when i say the language skills am saying something like you mentioned something like for example if they go to standard seven class and they feel like these students are understanding what I am saying so they can switch to Chichewa, now the teacher has to know that this Chichewa is enough so they have to go back to English*

Mr. Chipasula: yah to English

Researcher: *yah something like that, so it's like they must be a language skill somehow s somewhere do you have any*

Mr. Chipasula: *no we don't teach that now you can do this, do this*

Researcher: *eeh*

Mr. Chipasula: *I think we just train them to use their thinking for example try to*

Researcher: *ummhu*

Mr. Chipasula: *yah*

Researcher: *so you don't have something like, not necessarily that now am going to build there language but a deliberate thing just to encourage them or to develop their language skills in your class*

Mr. Chipasula: *the language skills, most of the times we say we use may be materials sometimes will help to communicate laughing*

Researcher: *ok I don't know if, are they told about the languages that they are going to meet when they go to school like ku primary kuja, I don't know do you tell them or*

Mr. Chipasula: *yah we tell them that from STD 1 to STD 4 its Chichewa, from STD five to eight is English and since STD five is transition we allow mixing that's all*

Researcher: ok

Mr. Chipasula: *yah*

Researcher: *you tell them as, in your class or as they go for teaching*

Mr. Chipasula: *ah in our classrooms we tell them*

Researcher: *ok, so*

Mr. Chipasula: *and sometimes we, they go to demonstration school we have demonstration schools*

Researcher: *oho*

Mr. Chipasula: *they observe lessons sometimes they prepare there own lessons, or they practice, and after teaching I think its 3 per day per class we use, we use one day per week*

Researcher: *panopa munayamba kale*

Mr. Chipasula: *ayi pano sitinayambe, koma I think ndinaona programme time table yatsopano yatuluka koma ongodikila programme kuti ituluke yoti awalembe mayina onse kenaka awangawengawe, so from, on Tuesday timatenga ma classes from a up to f*

Researcher: *they go*

Mr. Chipasula: *yah for two hours so there its three periods*
Researcher: *ma forty minutes, forty minutes*
Mr. Chipasula: *yah forty minutes, ah no it's not forty its thirty five minuets*
Researcher: *oh thirty five*
Mr. Chipasula: *yah in senior classes ah junior and senior, in infant classes its thirty*
Researcher: *ok*
Mr. Chipasula: *so its three periods, so for infant they use thirty minutes for discussion, they come here they discuss*
Researcher: *they discuss*
Mr. Chipasula: *lesson imene ijayo ayamba mmodzi chifukwa mwina wina akphunzitsa English win ape wina maths so they discuss one lesson ah paja munaona bwanji you ask there friends to contribute ah mwina paja mukanatere, or mukanapanga chonchi*
Researcher: *so akamapita ukoko, amakaphunzitsa any subject*
Mr. Chipasula: *any subject yomwe agawa, college imangopanga identify tsiku lakuti, imakapanga arrange with the demonstration here kuti mwina panopa ku standard one tiphunzitsa subject yakuti std 2 subject yakuti, three ndiye gulu lateuseday limapita koyambirila kukatenga ma topic masubject teacher aja amawauza kuti week ya mawa mukuti mudzaphunzitsa pa chiwiri, pachiwiri tidzakhala tikupanga izi*
Researcher: *owwo ndiye amatenga zimenezo*
Mr. Chipasula: *ndiye amtengano zimene zijazo abwereka ma teachers guide ndi ma pupil's book alemabano lesson plan, lesson plan amalemba okha, then amadzacheketsa, Kwa subject teacher wina aliyense*
Researcher: *ok*
Mr. Chipasula: *ndiye ukacheka you give grade then you help her or him to improve, kuti mwina apa utakapanga chonchi apa chonchi, apa chonchi, eya*
Researcher: *ndiye akapita, they teach, inu mukhala konko akamaphunzitsa*
Mr. Chipasula: *yah akamaphunzitsa ndiye kuti kuno tisiya ma mathematics teacher educatorss ena oti they should take care of the six or seven remaining classes, ndiye ena tonse timapita uko with the help of thawi zina tikachepela tili ndimaziphunzitsi ena oti are well experienced aku demo, amatithandiza kupanga supervise*
Researcher: *ok, then they come and then you discuss the lessons*
Mr. Chipasula: *ndithu*
Researcher: *owwo ok now if we consider this issue of language I don't know, may be its me who is, kuyiona mwa tundu wina wake, komano ndimangofuna ndongodziwa kuti kaya ndi a college or department of technical, teacher education or any organization if some times they do arrange like short courses or any developmental courses in terms of language now*
Mr. Chipasula: *ah so far in terms of language I don't know, nothing*
Researcher: *no*
Mr. Chipasula: *yah but sometimes methods yah and new subjects like life skills yah they are sometimes called to MIE, they discuss how they can teach some of the topics*

Researcher: *ok now from your experience do you feel like may be there is something that you feel that if they can do this I can improve here or I can improve this*
Mr. Chipasula: *yah I think in-service training so that this problem of language, yah indeed is a challenge we feel some students and pupils fail they don't understand because of this language and also I think they is need to have should I say dictionary or what on terminology if .. to say zithu za godya zinayi (Chichewa mathematical term), and then you say what is godya (Chichewa mathematical term meaning "corner") laughing*
Researcher: *it's like there are other terms that are easier in English than*
Mr. Chipasula: *than in chichewa and when I recall my time when we were learning Chichewa at primary and secondary school I feel now days its more difficult to say in those days we said adjective, laughing, so writing English word in Chichewa*
Researcher: *so pano ayipanga translate*
Mr. Chipasula: *yah ayipanga translate so may be since we use this English word triangle may be it helps instead of saying chithu cha godya zitatu*
Researcher: *so when you use triangle ndiye kuti ilembedwenso mchichewa*
Mr. Chipasula: *ilembedwa mu mchichewa mu std one muja timaphunzitsa, mu std 2 I think timaphunzitsa*
Researcher: *ndiye amayilemba bwanji*
Mr. Chipasula: *thilayango*
Researcher: *laughing owo ok*
Mr. Chipasula: *ehe amalemba thilayango, kwandalato*
Researcher: ndiye akafika STD five akadziwe kuti thilayango uja timalemba mchichewa uja ndi uyu
Mr. Chipasula: *yah ndi uyu so pamenepopo ndiye pali danger yina kuti mwana ayambe spelling ija ayichotse from Chichewa to English zimakhala zovuta komanso kuti tinganizire zoti triangleyo tizinena kuti chithu cha ngodya zitatu penapakenso ndipovuta, masiku anonso ngakhale mwana kumuuza kuti ngodya sangamve chifukwa ngakhale kumidzi amausable corner ah iwe tapita pa cornerpo*
Researcher: *bwanji osapanga kuti ngati ma terms ngati amenewawa angokhala mmene alilimu kumaphunzitsa Chichewa koma me technical terms azikhala mmene alilimu can't it help*
Mr. Chipasula: *laughing, yes it can, (laughing)*
Researcher: *so it's like triangle, what else may be like to say factors do you have a Chichewa name*
Mr. Chipasula: *ayi*
Researcher: *ndiye amalemba kuti cha akamaphunzitsa ana amat cha*
Mr. Chipasula: *basi amangonena ma fakitala*
Researcher: *alembanso Chichewa mafakitala*
Mr. Chipasula: *yah alemba ma fakitala*
Researcher: *owwo*
Mr. Chipasula: *komanso chifukwa ma factor saphunzitsidwa bwino bwino from STD 1 up to 4, I think kumeneku sitinena kwenikweni kuti mafactala, timangoti like multiplication, tayimusani manambalawa, ndimanambala ati tingatayimunse ndikupeza six basi kusiyana ndikuti tichite kunena kuti find factors of six.*

Researcher: *ok ah I don't know if, what should we expect from your class in terms of kuti what is the topic that you are teaching is it koyambilira or muli pakati or muli kumapeto*
Mr. Chipasula: *ummhu classyo thawi imene ndinachokayi anadzawayambitsako Mr. K pang'ono ma decimals, pang'ono*
Researcher: *ok so we should expect kuti ndikoyambirila*
Mr. Chipasula: *eya ndikoyambirila*
Researcher: *ok, at least we are lucky timanganiza kuti mwina tikupezani muli pakati or kumapeto kenako tikalumikiza*
Mr. Chipasula: *ayi*
Researcher: *ndi topic ina*
Mr. Chipasula: *ayi ndikoyambilira*
Researcher: *ok, so mainly ma objectives amakhala otani*
Mr. Chipasula: *zina zimangokhala ngato zowakumbutsa ngati ku ali ku primary kwenikweniko pena ngati ku secondary pang'ono nthawi zina zomwe timafuna ngati terminology pang'ono ngati understanding so sometimes we ask them definitions modeling solving and sometimes how they can introduce when they are teaching*
Researcher: *so it's like you go, anyway may be I should ask, do you combine like this methodology part and the content or you teach separately*
Mr. Chipasula: *no I will combine*
Researcher: *ok so then you teach the content and then the methodology*
Mr. Chipasula: *yah*
Researcher: *ok what about like the lesson, do you teach; for every topic do you teach the lesson plan?*
Mr. Chipasula: *for lesson plan for them to teach when they are teaching or for our lessons*
Researcher: *no, for example you said you are teaching them decimals*
Mr. Chipasula: *oh in the lesson plan yes sometimes we combine, but sometimes we have the content part on its own if it's difficult to combine because for some topic like HCF and lcm mostly its how to teach*
Researcher: *ok, so it depends with a topic*
Mr. Chipasula: *yah , it depends with the topic, if the topic is more covered may be in std eight it means we have to do first of all at content because we know that many of them laughing there mathematics is not at all that good, yah*
Researcher: *ok, then the other thing is what do you think would be possibly the language challenges that you may meet in the topic that you are going to teach*
Mr. Chipasula: *decimals, for language in decimals, ah no because Chichewa word we say masamu ama decimals, so it's laughing more like English*
Researcher: *and is it topic for senior classes or junior classes*
Mr. Chipasula: *ili ku junior, imayambira std 4, ku juniorko pang'ono chifukwa cha matambala cha machani, so kwambiri imayambira ku five*
Researcher: *ku five kumapita kutsongolo*
Mr. Chipasula: *eya*
Researcher: *so it's all English*
Mr. Chipasula: *yah*

Researcher: *ok, chabwino, I think ndimafunso amene ndinali nawo I don't know if you have anything to add.*

Mr. Chipasula: *zimangovuta kuti thawi zina ma researchiwa amngothera choncho, mwina zikachuluka kwa akuluakuluwo zimango psijiridwa penapake, kenako basi, zikanakhala kuti zikutuluka bwinobwino, kumakhalabe ndi ka impact kenakake kuti bwanji apapa mwina kumazipititsa ngati ku MIE kuja kuti polemba ma buku positha curriculum at least tizizipanga apply*

Researcher: *so it's like after all the findings aku MIE atamadziwa*

Mr. Chipasula: *eya atamadziwa, zina amadziwa chifukwa thawi zina tikamalemba ma buku amatha kukambako, koma zija zoti satengera bwino bwino, mwina zomwe zoopa policy zo sazitengera bwino bwino, chifukwa ma findings a ma research tiyeni bwanji tipange izi, ndi methodology yokhayi panopa ndi imene ayamba kuyipanga emphasisekuti malo moti basi ana aja ku primary school ti zi ngowauza tiziyesetsako kuti nawonso azidzipangira*

Researcher: *ok iyayi I will try laughing tikamaliza tidzapanga, tikamaliza I will make the copies available.*

MR. OTANI

Researcher: *ndiye kwambiri like I explained mu mukalata muja kuti am looking at language and mathematics kwambiri I want to learn from you like from your experience kuti what is like the relationship between the language that we use in teaching whether its English or Chichewa or Chitumbuka or whatever and the mathematics komanso I just want to see like from your experience like the problems or the challenges that you meet when teaching when you are preparing these teachers the challenges more especially the language challenges when you are preparing them more especially in a mathematics classroom but also I just want to learn like the issues or the problems that you know that the primary mathematics teachers meet when they go in the field but also I just want to learn more about the like the Language-in-Education Policy whether is the Language-in-Education Policy for primary school but also the Language-in-Education Policy for the TTCs so basically all the questions will be focusing on these three areas*

Mr. Otani: *ok*

Researcher: *so, the other thing is the study that am doing is about multilingual classroom, so may be its like whatever we will be discussing we will be discussing in that context of multilingual may be like poyambira like may be tikhale with the same definition of multilingual classroom ndiye I just want to get like your explanation about a multilingual classroom*

Mr. Otani: *alright, a multilingual classroom is a classroom where by ah, students express themselves in different languages, such as Chichewa, English, Chitumbuka or Yao. So that one, that's what we call a multilingual classroom.*

Researcher: *ok, how can we classify your class, the class that we will be visiting, should we expect that it's a multilingual or*

Mr. Otani: *yah, that one is multilingual because there are some who cannot express themselves in English so we accept Chichewa*

Researcher: *ok*

Mr. Otani: *sure*

Researcher: *ok ah now if we consider your teaching experience whether its from the primary or from secondary up to here from your experience aah what can you say may be about the relationship between the language and the delivering of the mathematics itself is there any relationship from your experience from what you have seen*

Mr. Otani: *yah, pupils in primary schools had difficulties to express themselves in English, but there are comfortable in speaking Chichewa or mother tongue language ah more especially in infant classes, I had a lot of problems (meaning when he was teaching mathematics at primary school) so here in TTCs, here we have problems some of the students cannot express themselves in English that is why for us to help them, we have to accept them, they have to speak Chichewa or Chitumbuka, or (not clear)*

Researcher: *ok,*

Mr. Otani: *sure*

Researcher: *so, its like when you are in class your allow them to speak there local language*

Mr. Otani: *yah but not actually allowing them but some them fail even to express themselves so for us to get what they want to say its when we can allow them to express themselves in mother tongue language but otherwise the official language is English*
Researcher: *ok, so like in your class what languages do they speak normally*
Mr. Otani: *normally they speak English and chichewa*
Researcher: *ok*
Mr. Otani: *sure*
Researcher: *ok, are their may be any students who can express themselves like in Chitumbuka*
Mr. Otani: *yes*
Researcher: *in your class*
Mr. Otani: *yes, there are so many from the north*
Researcher: *ok, are there may be some students who can express themselves like in Chitumbuka in your class*
Mr. Otani: *yes, there are so many from the north*
Researcher: *ok, so do they may be sometimes use that Chitumbuka*
Mr. Otani: *yah sometimes, yes*
Researcher: *so what happens like yourself do you understand*
Mr. Otani: *ah, sometimes there is a breakdown of communication since I don't understand much of Chitumbuka so there is sort of breakdown in communication but I know (not clear)*
Researcher: *ok, so it's like when you are in a class, for example if you ask a question like in English and there is a student who cannot express himself may be fully in English or fully in Chichewa*
Mr. Otani: *yah*
Researcher: *he can explain it in Chitumbuka*
Mr. Otani: *in Chitumbuka*
Researcher: *no problem*
Mr. Otani: *no problem*
Researcher: *ok,*
Mr. Otani: *sure*
Researcher: *unnhu, now how does affect you in, or does it have any impact in preparing these teachers when you are preparing then, when you are teaching them, these language issues do they affect your teaching*
Mr. Otani: *yah, they affect my teaching since that some of them they don't hear me properly because of communication barrier*
Researcher: *how do you address those issues when you meet them, when you have that situation?*
Mr. Otani: *I see now one to one, I should say one to one approach now, where by I cal a student then let him or her in the language that we can communicate freely*
Researcher:*: ok*
Mr. Otani: *and that's an individual approach now*
Researcher: *ummhu*
Mr. Otani: *sure*
Researcher: *ok so it's like you just call them to your office*
Mr. Otani: *yah*

Researcher: *and then talk*
Mr. Otani: *yah*
Researcher: *and now in that case you talk now using like the language that you can understand*
Mr. Otani: *yah*
Researcher: *oh. Ok*
Mr. Otani: *sure*
Researcher: *so, like, like yourself, you have said you have taught ku primary school for is it two*
Mr. Otani: *two years*
Researcher: *two years, eti, eh, do you, or what are the challenges that you yourself that time as a mathematics teacher or these teachers when they go there teaching in primary school when they are teaching mathematics what are like the challenges that are more likely to meet or that you met that side the language challenges*
Mr. Otani: *the language challenges*
Researcher: *ummhu*
Mr. Otani: *ah, one is failure to communicate in English, the other one is, I said first is failure to communicate in English, and the other one where some (of the students) will be posted to the areas where they speak other languages like the Chewa posted to north where they speak Chitumbuka and they don't know Chitumbuka so it's difficult for them to communicate with students*
Researcher: *ummhu*
Mr. Otani: *sure*
Researcher: *so it's like most it's the problem of communication*
Mr. Otani: *communication*
Researcher: *so is it in terms of the learners or in terms of the students*
Mr. Otani: *yah in terms of the learners and the students, both of them*
Researcher: *both of them*
Mr. Otani: *yah*
Researcher: *so in that situation ummhu what can you advise them to do like the student teachers here for example if they go there and they they cant may be express themselves themselves like in English or the students that they are teaching the pupils they cant they cant understand them, what does he do as a teacher*
Mr. Otani: *yah, ah we advise them mostly to use teaching and learning resources so that pupils can understand them better, sometimes you may explain using teaching and learning resources unlike just explaining to them*
Researcher:
Mr. Otani: *sure*
Researcher: *so for example like, somebody is like in std 7 where may be is expected to teach in English through out, but may he sees like may be there is a difficult here in understanding, I have tried or may be using the teaching and learning aids trying to explain using those aids, but still can sense that may here these pupils are not getting it, in those situations are they allowed to switch*
Mr. Otani: *yah they are allowed to switch, to speak in, ah in other languages provided the communication is there between the pupils and the teacher*
Researcher: *and to what extent do you allow this switching*

Mr. Otani: *this you see that if you can explain the pupil can't understand what you are explaining it's when we can switch to our, our vernacular language*
Researcher: *vernacular language*
Mr. Otani: *yah*
Researcher: *so if, if it's the case like the teacher himself, he can't express himself*
Mr. Otani: *he can't express himself*
Researcher: *may be the students they can express in English but now the teacher cant*
Mr. Otani: *laughing*
Researcher: *in that situation, what can he do*
Mr. Otani: *in that one that one is difficult, since the assessment here at TTC if a teacher can not express himself so how can he or she can go through this course, we assist them here, if they have got problems, these problems should be rectified here, before they go to school*
Researcher: *ok, so in your classes what don you do, like may be just to improve there language skills, their communication*
Mr. Otani: *yah we encourage them to speak in English*
Researcher: *in English*
Mr. Otani: *so that we can have, we can have practices*
Researcher: *do you have like any strategies that these are the strategies that I use to improve their skills, the spoken or not only spoken but whether its written or whatever communication*
Mr. Otani: *ah, according to mathematics and science we don't have any strategies but I understand in English there is a strategy where by they can have drama or what, what,*
Researcher: *ummhu*
Mr. Otani: *sure, but in mathematics ah no*
Researcher: *ah, what about like in terms of the activities that you normally do in your classrooms, do you have any activities that can, may be improve there ujeni, there language practices*
Mr. Otani: *yah sometimes we may have a problem, you give them a problem then they should discuss this problem in groups, so as they are discussing in groups they are able to (nor clear) and they are able to practice how to speak English*
Researcher: *ummhu*
Mr. Otani: *sure*
Researcher: *ok, unhu ok now if we come here now at TTC what are the language challenges that you frequently meet when you are these mathematics teachers*
Mr. Otani: *ah challenges*
Researcher: *yah, language, more especially the language challenges, when for example you are in class and you are teaching them, what are the difficulties that you meet or the language difficulties that you meet in the classroom or something that you see that this is coming in may be because of the issue of language,*
Mr. Otani: *to me as a teacher or to the students*
Researcher: *I think may be we can talk of both sides*
Mr. Otani: *laughing*

Researcher: *you as a teacher you think ah this is a problem, and that this problem I think its coming because of language or to the side of the learners, this problem is coming in because of the issue of language*
Mr. Otani: *ah but to me I don't have much problems, but to students yes they are so many problem more especially as I said earlier own to express themselves it's a its difficult*
Researcher: *what about like in understanding you, or in understanding the concepts*
Mr. Otani: *alright, here there is no problem they even understand me better but if they have got difficulties in understanding that is now an individual now*
Researcher: *ummhu*
Mr. Otani: *aha*
Researcher: *so, if like yourself do you sometimes switch*
Mr. Otani: *to chichewa*
Researcher: *eee*
Mr. Otani: *yah, more often*
Researcher: *ok, when do you normally switch to, to Chichewa, I know it might be difficult to may be sometimes its difficult to observe yourself kuti muthu umangoona kuti you have slipped to Chichewa osaona kuti umangoona kuti walakhula Chichewa eti, anyway but may be in the course of teaching may be you have observed that may be thawi yakuti yakuti tukafika pakuti pakuti, timakonda kulakhula Chichewa (I switch to Chichewa)*
Mr. Otani: *ah sometimes I may speak Chichewa when introducing a lesson if I see that they are not understanding that's when I can go to Chichewa and back to English*
Researcher: *so its like the emphasis is on or what is the emphasis*
Mr. Otani: *the emphasis is trying to communicate to these students so that we may understand each other*
Researcher: *aha*
Mr. Otani: *sure*
Researcher: *now these, like these challenges when you meet them at pr in the classroom, do you discuss them like with your friends whether formally or informally or at departmental level*
Mr. Otani: *yah those that are teaching mathematics*
Researcher: *ummhu*
Mr. Otani: *yes we discuss*
Researcher: *do those discussions help in anyway, or just an example may be you go to common room pa tea break paja, in a way somebody cracks a joke mwina yam class eti, or whatever, or mwina ine lero mclass munachitika zakuti zakuti, ok so like you are expressing the language challenge that you met in class, what responses do you get from your fellow mathematics teacher educatorss*
Mr. Otani: *I get responses, most of them are positive since that sometimes they may advise you to say that you were wrong because of this, this, this or students were wrong because of such, such, such*
Researcher: *unnhu*
Mr. Otani: *sure sometimes its you as a teacher aha you can make your pupils not to understand you because of how you express yourself, sure*

Researcher: *ok, now ah am not very sure, but I understand like STD 1 and 2 they use something like Chichewa*
Mr. Otani: *yah Chichewa*
Researcher: *ah how do you prepare these teachers because you don't know who is going to teach Chichewa*
Mr. Otani: *Chichewa yes*
Researcher: *who is going to teach in English?*
Mr. Otani: *yes*
Researcher: *yet they are in one class,*
Mr. Otani: *yes*
Researcher: *how do you prepare them?*
Mr. Otani: *yah sometimes we may speak in English but when giving examples we may give in Chichewa, how can you introduce ah how can you introduce one, there when explaining how they may introduce one you may use Chichewa so that they may understand how they can introduce that problem*
Researcher: *aha,*
Mr. Otani: *sure*
Researcher: *so it's like you use Chichewa to demonstrate that this how you do it*
Mr. Otani: *aha*
Researcher: *so you do that*
Mr. Otani: *you do that*
Researcher: *in Chichewa*
Mr. Otani: *in chichewa*
Researcher: *what about if, I don't know do you allow the micro teaching in your class?*
Mr. Otani: *yes, kwambiri*
Researcher: *what do they do, they do*
Mr. Otani: *they use Chichewa now, instead of English they should use Chichewa, why because they are now going to teach in chichewa*
Researcher: *ok so when they are presenting like in Chichewa do they do you see like any challenges in those lessons, the difficulties that the students meet*
Mr. Otani: *ummhu they are so many most, of makamaka tinene kuti ah language problems since we are from different areas they can not express themselves in Chichewa*
Researcher: *so what do they do like in your class*
Mr. Otani: *laughing*
Researcher: *for example say you have given them STD one material or say you do the micro teaching for STD one*
Mr. Otani: *yah*
Researcher: *what do they do?*
Mr. Otani: *yah they they try, they try hard to express themselves in Chitumbuka*
Researcher: *in chichewa*
Mr. Otani: *in Chichewa, not in Chitumbuka but with difficulties*
Researcher: *are they allowed say to switch between Chichewa and Chitumbuka, do they switch*
Mr. Otani: *during teaching*

Researcher: *yah, that micro teaching like the STD one micro teaching*
Mr. Otani: *ah yah but it may be difficult*
Researcher: *difficult, it should be Chichewa*
Mr. Otani: *yah Chichewa*
Researcher: *ok, how can this be, or can there be any way of how it can be solved can be rectified*
Mr. Otani: *that problem I don't know may be if these students can be posted to their home district may be this problem can be solved*
Researcher: *can be solved*
Mr. Otani: *aha, the teaching in their own mother*
Researcher: *tongue language*
Mr. Otani: *tongue language*
Researcher: *ah, ok*
Mr. Otani: *sure*
Researcher: *ah, the other thing that I wanted to know is about like the Language-in-Education Policy*
Mr. Otani: *yah*
Researcher: *I just wanted to be clear what like the really official language for like primary schools*
Mr. Otani: *yah ah in the infant it's mother tongue but in senior classes its English*
Researcher: *senior classes start from STD what*
Mr. Otani: *from STD five*
Researcher: *STD five to*
Mr. Otani: *STD five to eight*
Researcher: *to eight so its five to eight use English*
Mr. Otani: *English*
Researcher: *then one to four*
Mr. Otani: *mother tongue*
Researcher: *use mother tongue, ummhu ok so how does this policy now, taking into consideration this policy does it have any effect on your teaching or its like do you, or does it influence you in any way on how you prepare these mathematics teachers*
Mr. Otani: *laughing, ah but it's a its difficult for us to handle this issues, since here we are depending on English and some times Chichewa, other languages its difficult for us so its difficult*
Researcher: *and what about here at TTC do you have the official language*
Mr. Otani: *the official yah it's English*
Researcher: *it's English*
Mr. Otani: *yes*
Researcher: *I was I have asked this question because I was thinking of I don't know but I think my understanding is, mat be before I come to that may be I should I ask you like*
Mr. Otani: *yah*
Researcher: *how do you teach them is it is it content, is it just mathematics content or you mix the methodology together?*
Mr. Otani: *we do mix methodology and content*
Researcher: *ok*

Mr. Otani: *ehe*
Researcher: *how do you do it*
Mr. Otani: *after teaching content then you come to methodology*
Researcher: *so what type of the content because, am not very sure, you help ok*
Mr. Otani: *laughing*
Researcher: *it's like the content that you have it's the primary content*
Mr. Otani: *sure*
Researcher: *it's not something that is abstract*
Mr. Otani: *yah*
Researcher: *its something that they have gone through, so how do you teach them*
Mr. Otani: *ummhu*
Researcher: *I don't know if you are getting what am saying*
Mr. Otani: *yah sometimes we teach them the content at primary level and after that the methodology, but we have another topic which are not taught in primary schools but since they told us that they know mathematics so we have other topic apart from those that they are going to teach at primary schools*
Researcher: *so for example you have, let's take an example of ah say fractions, adding fractions or subtracting fractions*
Mr. Otani: *aha*
Researcher: *multiplying, now this topic it's like the students already know this topic because it's a primary topic*
Mr. Otani: *sure*
Researcher: *so you assume that this person or these teachers they have to or they know this topic now in your teaching how do you teach them is it to teach them to understand the material or to teach them to know how teach the material*
Mr. Otani: *first of all we revise the content so that they are they forget the content they should come up aha, zimatere zimatere, after that its when you came to methodology part and you stick to that methodology part*
Researcher: *ummhu*
Mr. Otani: *sure*
Researcher: *so I wanted to connect it ndi issue ya Language-in-Education Policy, yonena kuti ku primary tili ndi yoti from std 5 to 8 they have to use English eti as the LoLT then std 1 to 4 they use their mother tongue language or the local language now we have the TTC here you are preparing these teachers that will meet this, that will have to use this policy,*
Mr. Otani: *ehe*
Researcher: *so I was think that may be they should be a link am not very sure eti,*
Mr. Otani: *laughing*
Researcher: *is there any link between the languages that you use here, because you are training this so*
Mr. Otani: *yah laughing*
Researcher: *so that they can teach using, so I was thinking that may be there is somehow a link*
Mr. Otani: *laughing, yah there is a link since here we are just teaching them skills and they can express these skills in their own language but we teach them in English*

Researcher: *in English*
Mr. Otani: *sure*
Researcher: *so its up to them to translate those*
Mr. Otani: *yah*
Researcher: *in their local languages wherever they go*
Mr. Otani: *ehe*
Researcher: *owo, ok*
Mr. Otani: *sure*
Researcher: *so or the other thing I wanted to find out its about the since the implementation of this Language-in-Education Policy about the mother tongue language I just wanted to find out if you have any attended any course whether its by the college or DTED or the MOE like one just sensitize you about the Language-in-Education Policy how you can handle it or how you can help the student teachers to implement*
Mr. Otani: *ah, by the mean time no*
Researcher: *ok*
Mr. Otani: *eeh*
Researcher: *not even by the college*
Mr. Otani: *ah no*
Researcher: *ok*
Mr. Otani: *sure*
Researcher: *ummhu what else did I want, oh ok the other one that I wanted to ask is do you have any recommendations for you like that you like to be in a better position to prepare these student teachers what would you recommend that now for you as a mathematics teacher educators*
Mr. Otani: *aha*
Researcher: *for you as a mathematics teacher educators do you see that may be if I can go may be for this course or if this can happen I think I can improve on this, I can improve on this,*
Mr. Otani: *yah there are mmhu two or three areas, academically if I can go further from this diploma up to degree level yes I can improve in other areas and the other one is if I can be exposed to course like in other languages like Chichewa, or English or Chitumbuka or what what on how I can handle, it would be better*
Researcher: *ummhu*
Mr. Otani: *sure*
Researcher: *ok so it's like there can be in-service trainings*
Mr. Otani: *yah in-service trainings*
Researcher: *then, for specifically for the languages*
Mr. Otani: *ummhu*
Researcher: *ok*
Mr. Otani: *sure*
Researcher: *ummhu, I think asked all the questions, of course the other thing that I wanted to ask is about the lesson that we are going to observe, I just wanted to have like in mind before I go to class the topic and if you know the objectives that you can remember the objectives that you are trying to achieve and tikamalowa mclass what should we expect is it koyambirira kwa topic or muli pakati or kumapeto*

Mr. Otani: *ah ok. Ah the topic is just decimals, decimal fractions, ah we are just introducing, I will just be introducing this topic*
Researcher: *ok so its at the beginning*
Mr. Otani: *yah at the beginning ah,*
Researcher: *ok*
Mr. Otani: *sure*
Researcher: *and what will be the objectives*
Mr. Otani: *the objectives are to prepare these students to teach the topic in primary schools*
Researcher: *ok*
Mr. Otani: *sure*
Researcher: *can you may be foresee any language challenges that you are may be going to meet*
Mr. Otani: *ah*
Researcher: *when teaching this topic*
Mr. Otani: *ah not really, but with mwina with some people may be with these students about mother tongue*
Researcher: *mother tongue*
Mr. Otani: *sure ndithu*
Researcher: *ok I don't know if there is something may be you just want to add on the issue of language imene mukuona kuti sitinayikhudze koma may be it can be of interest*
Mr. Otani: *ah kwa ine ndimaona ngati kuti pa issue yoti ana aziphunzira muchilakhulidwe zawo issue imeneyo ndimaona ngati ikhoza kudzakhala yovuta kumapeto kwake mwina tikanamakhala ndi one mother tongue language imene anawa akanamaphunzirirapo ndiye ikanakhala bwino, unlike kuti yao should be taught in yao, Chitumbuka in Chitumbuka, khonde in khonde zitha kukabweretsa chinachake kutsogolo kwake chimene choti ku mathematics tikhonza kudzakhala ndi vuto lina lake and ku ma students its difficult lets say someone from kasungu has been posted to Karonga akaphunzitsa bwanji mu chikhonde woti samadziwa kuti chikhondecho chimatani. Zimenezi zidzapangiatsa kuti ma students a ku mpoto azipita kuti*
Researcher: *kumpoto*
Mr. Otani: *kumpoto, aku mwera azipita kuti, kumwera because of communication ndi zimene ndingalakhulepo*
Researcher: *ok, ndiyeno ndikhoza kuonjezerapo funso*
Mr. Otani: *eya*
Researcher: *I just want more clarification on on for example, any way ndiyambe ndikuti, I just want to build it may be ndikangoyifunsa may it will not make sense*
Mr. Otani: *ok*
Researcher: *was there any official communication whether from the principal or from the MOE to advise you that this is the Language-in-Education Policy and why they have done that*
Mr. Otani: *yah pamenepopo ndiye ndisaname sanapange*
Researcher: *sanapange*
Mr. Otani: *eya sanapenge*
Researcher: *so its or in other words*

Mr. Otani: *I think implementation yake sanapange koma zikadali pa trial basis I should say*
Researcher: *oh ok panopa akanali pa trial*
Mr. Otani: *ehe*
Researcher: *koma they have a policy that is there*
Mr. Otani: *yoti akumapangapanga ndithu, kuti akumangochi*
Researcher: *ok komano pa college level sanakuuzeni*
Mr. Otani: *sanatiuze ndithu*
Researcher: *and the reasons why they are doing that*
Mr. Otani: *ayi*
Researcher: *ok, so it means kuti when these people go for teaching is it means it depends ndikumene apitako kuti if its school yoti it's under trial for this language it means they have to follow this new liEP*
Mr. Otani: *yes*
Researcher: *but if they go to schools that are not*
Mr. Otani: *koti kulibe ujeni, ukoko ndiye akhoza kumakagwiritsa tchito ma languages ena*
Researcher: *amene angathe kupanga*
Mr. Otani: *yes*
Researcher: *ok, the other question I wanted to ask ndiyoti its like you have explained kuti if they have one language eti one mother tongue language that can be used I just wanted to find out is what problems can you foresee if the implementation of mother tongue is in full swing the whole country, what problems could we have*
Mr. Otani: *we are likely to meet regionalism now, coz those from the north they will be going to the north so that there is communication now and those from here (central) will be here and those from the south they will be going to the south but otherwise it will be difficult for us*
Researcher: *ok and I don't know, will it be possible say to have one language, one mother tongue language for every body?*
Mr. Otani: *it is impossible since its like as we are using English to other people it will be difficult*
Researcher: *so what do you suggest can be the way forward?*
Mr. Otani: *we should just use our official language ah English*
Researcher: *like from STD one*
Mr. Otani: *yah from STD one*
Researcher: *what about the issue of, ok if they say lets combine English and our mother tongue*
Mr. Otani: *yah ok that one yes that is if you are comfortable to speak*
Researcher: *ok so its now if you are comfortable*
Mr. Otani: *yah*
Researcher: *ok now, any way am not asking this not but I just to learn more, if we have like these problems of may be the students are not understanding the concepts because of the language for example may be like because of English, ok in that sense what can you say about the use of language, the local language*
Mr. Otani: *they are not getting the concepts because of English*
Researcher: *yah because of English*

Mr. Otani: *it's better to use vernacular because what is important is for them to understand the concepts*
Researcher: *so in other words what you are trying to recommend is that we should not have mother tongue yokha or as use English yokha but they can use the two*
Mr. Otani: *eya akhoza kupanga mix*
Researcher: *in all classes or in special classes*
Mr. Otani: *koma ku infant and junior they can mix, but for senior classes we just use English*
Researcher: *what can be the reason behind it kuti from STD 5 to 8 they have to use English,*
Mr. Otani: *the reason is for them to have a lot of practice so that they can express themselves in secondary education and tertiary education*
Researcher: *ok,*

APPENDIX B: EXAMPLES OF THE LESSONS OBSERVED

MRS JOSHUA LESSON ONE

Mrs. Joshua: *…ok, …. Let's start with … (mathematics teacher educators distributing a piece of chalk) … how many parts do you have*
Ss: *two*
Mrs. Joshua: *ok, have two parts, now if you get one, just one part, what name do you give ah to that part of the piece of chalk, what name can you give, yes (pointing to the student)*
S1: *fraction*
Mrs. Joshua: *a fraction, ok yes (another student)*
S2: *half*
Mrs. Joshua: *half ok any other different answers, this group, what do you say*
SG1: *half*
Mrs. Joshua: *half, this group*
SG2: *half*
Mrs. Joshua: *half, that group*
SG3: *half*
Mrs. Joshua: *half*
SG4: *part*
Mrs. Joshua: *part, ok sp we have (writing), so we are saying the process we have, just one piece we have after breaking one piece of chalk, others are saying its half, others are saying its part, part of a piece of chalk eti*
Ss: *yes*
Mrs. Joshua: *others are saying it's a fraction, ok*
Ss: *yes*
Mrs. Joshua: *ok, so the part which you have, the part which you have is a fraction, ok the part which you have is a fraction, what is a fraction? Yes (pointing to a student)*
S3: *it is a part of a whole*
Mrs. Joshua: *(writing), part of the whole, part of the whole, so as others have put, others were saying, if you get ah that piece of chalk which is not a whole, you said it's a part, so that's included there so (pointing to the given definition), when we say that piece is part of the chalk that means it's a! Fraction, ok, ok lets reserve the half (while circling the half), lets reserve the half, ok we are saying part of*
Ss: *the whole*
Mrs. Joshua: *the whole (underlying the whole in the definition), what do we mean by the whole, whole is what, yes (pointing to a student),*
Ss: *the whole is one thing*
Mrs. Joshua: *one thing, ok others, yes*
S5: *the full thing*
Mrs. Joshua: *full thing, others, yes*
S6: *unbroken thing*
Mrs. Joshua: *unbroken (writes), yes*
S7: *without a missing part*
Mrs. Joshua: *without a missing part (writes), yes*

S8: *a complete thing*
Mrs. Joshua: *a complete, lets have another exercise (distributes six bottle tops to each group), imagine these bottle tops are, are plates, ok that's six, imagine these bottle tops are plates,, that's six (continues to distribute), ok, imagine that those bottle tops are plates, I hope we have seen or we have some (explaining as she goes to front), sets of plates, sometimes are six, sometimes are how many*
S9: *twelve*
Mrs. Joshua: *sometimes are eight, ok and one is broken, one is broken, do you have a fraction or the remaining are they making fraction or they are not, raise up your hand, yes*
S10: *they are making a fraction*
Mrs. Joshua: *they are making a fraction, others*
S11: *they are not making a fraction*
Mrs. Joshua: *they are not making a fraction; you are saying they are making a fraction, why? Can you explain, why do you saying they are making a fraction*
S10: *I understand that ah, ah we had a piece of chalk and then we break it, and you say, you said that one part, one part of piece of chalk is a fraction, so just the ….*
Mrs. Joshua: *so because one plate has been broken then*
S10: *it's a fraction*
S11: *then you have said it's not a fraction, you said is not a fraction or what*
S12: *he said is a fraction*
Mrs. Joshua: *because is broken*
S12: *yes*
Mrs. Joshua: *ok, are you saying it's not a fraction*
S11: *yes*
Mrs. Joshua: *why*
S11: *its not a fraction because lets say when you take these bottle tops we have six bottle tops and we take one, that means we are remaining with five bottle tops*
Mrs. Joshua: *so they are full*
S11: *yes*
Mrs. Joshua: *so it's not a fraction*
S11: *it's not a fraction*
Mrs. Joshua: *ok, are we together*
Ss: *yes*
Mrs. Joshua: *ok, now lets see, look here, do we still have the whole set*
Ss: *no*
Mrs. Joshua: *its not complete, is it a whole*
Ss: *no*
Mrs. Joshua: *so, therefore it is*
Ss: *a fraction*
Mrs. Joshua: *are we together*
Ss: *yes*
Mrs. Joshua: *ok so when we are saying a fraction is part of*
Ss: *a whole*
Mrs. Joshua: *now the whole (writing), is, is a complete thing of a complete! Set, ok*
Ss: *yes*

Mrs. Joshua: *(writing), so its either something is complete, like we had a piece of chalk, or we said is*
Ss: *complete*
Mrs. Joshua: *so that if we have ah six plates and one is broken, then those plates, six plates were making a set and one is broken, then what we are remaining with is! A fraction, are we together*
Ss: *yes*
Mrs. Joshua: *(referring to her notes writing naming and writing fractions), ok, so lets move on to naming and writing fractions (distributing pieces of paper to the groups being helped by a student), ok can we cut our piece of paper into two equal parts, two equal parts (students cutting in their groups), can one member from the group pick one piece of ah paper, one piece of paper, ok so you have (writes), one, one piece of paper out of how many*
Ss: *two*
Mrs. Joshua: *out of two, eti*
Ss: *yes*
Mrs. Joshua: *you have had two pieces, so you have picked!*
Ss: *one*
Mrs. Joshua: *so you have (writing), one piece of paper out of! Two pieces, ok, and that piece of paper because previously had one complete thing and now have part of it, that means that one piece which you have picked is!*
Mrs. Joshua &Ss*: a fraction*
Mrs. Joshua: *ok now how do you write that, that one piece of paper you …. It is one out of how many which you have (writing one over two)*
Ss: *two*
Mrs. Joshua: *ok that's one piece; one part which you have which you have is one out of! Two pieces of paper which you have, ok*
Ss: *yes*
Mrs. Joshua: *and its written as one bar down there two, ok so this is giving us ah (writing) number, in this case we have number of pieces of paper, number of pieces of paper picked (referring to one on top of two) over what!*
S13: *total number*
Mrs. Joshua: *total number of pieces (writes referring to two down), are we together*
Ss: *yes*
Mrs. Joshua: *with the other half, with the other half, can we fold this, can we make this complete, can we fold this, (lifting up to show the students) into three equal parts, into three equal parts, into three equal parts, (students folding as the mathematics teacher educators moves around the class), three equal parts, (after a while) have A, B, C for each part, A, B, C for each part, (going around the class again), we just take part A, part A, ah, part A is one piece out of how many*
Ss: *three*
Mrs. Joshua: *one piece out of*
Mrs. Joshua:*& Ss: three*
Mrs. Joshua: *so how can we write that*
Ss: *one*
Mrs. Joshua: *one (writes) over*

Ss: *three*
Mrs. Joshua: *(writes over three), so just part A alone is! One over three of!*
Ss: *the whole*
Mrs. Joshua: *piece of paper, ok, what if you have A and B (writes A + B), you have how many pieces of paper*
Ss: *two*
Mrs. Joshua: *(writing 2), out of how many, (writes over),*
Ss: *three*
Mrs. Joshua: *(writes), three so taking two things A and B you have two out of!*
Ss: *three*
Mrs. Joshua: *what about, what about if we have (writing), A and B and C (writes A + B + C),*
Ss: *three out of three*
Mrs. Joshua: *three over! (Writes),*
Ss: *three*
Mrs. Joshua: *(writes three down), now here we have had one over! Two and one over two mathematically is also known as*
Ss: *half*
Mrs. Joshua: *half, ok, now, and someone if you remember defined half, say if you have two pieces of chalk, then one piece of chalk is, a half, sinchoncho, but that is not always the case, its possible you can have a half, ok or you can just have part of it, most of us we are used, if we have something less that a one then we say it's a half, sinchoncho, kunyumba akatipatsa kapena titi bottle la fanta tangawana or wina watenga three quarter or wina quarter timati uyu tampatsa half, sinchoncho, but its not a half, most of us we get mistaken, instead of saying this is a fraction, we say this is a half, just as good as margarine, margarine ali onse basi timangoti stork, malo moti tinene tipatsireko stork basi tipatsireko stork*
Ss: *laughing*
Mrs. Joshua: *ok, lets not ah, lets not make that mistake instead of a fraction lets not say it's a half, ok, a half its only when you have two things ah one complete thing and then cut that thing into two equal*
Ss: *parts*
Mrs. Joshua: *that is you come up with*
Ss: *half*
Mrs. Joshua: *ok, so these halves, or these fractions you can also name them using a set of things like w had a set of plates, ah the set of bottle tops which we said bottle tops we take them as plates, ok, so we have our bottle tops if, how many bottle tops are there*
Ss: *six*
Mrs. Joshua: *now if you remove two or two get broken, what fraction is broken, we have*
Ss: *two*
Mrs. Joshua: *(writes) two over*
Ss: *six*
Mrs. Joshua: *total which is?*
Ss: *six*

Mrs. Joshua: *(writes six), ok so two out of six have got! Broken and we are remaining with*
Ss: *four*
Mrs. Joshua: *(writes four), four over*
Ss: *six*
Mrs. Joshua: *six (writes six), are we together*
Ss: *yes*
Mrs. Joshua: *ok, why are fractions important (rubbing the board and writing why do we need to know about fractions), why do we need to know about fractions, and why is it necessary to teach fractions to primary school learners? Can we discuss that, lets come up with not less than two points in our groups for five minutes*
Ss: *(students discussing while the mathematics teacher educators moves around the groups, not very noisy)*
Mrs. Joshua: *one, group one, what have you come up with*
SG1: *we have come up with three importance's the first one is it enables learners to come up with the concept of division,*
Mrs. Joshua: *how? Group one*
SG1: *…. whereby learners … if they don't have a concept of fractions … wherever the number is not divisible by the whole number, its like whenever they have a concept of fractions then ah they can be easily be free from problem of …*
Mrs. Joshua: *ok, so if one doesn't know the … cant, cant so it's a problem*
SG1: *that one no, but imagine, seventy five divide by two the learners will be …*
Mrs. Joshua: *ok, but not necessarily, ok not much, not the whole concept of division, ok, not the whole concept of division, but point two is equality in sharing available!*
Ss: *resources*
Mrs. Joshua: *ok*
Ss: *yes*
Mrs. Joshua: *equality in sharing available resources, and this is in our today, today, imagine they have ah, what could be an example, or even a piece of paper, the paper we had and we say can you share the two, these pieces of ah between the two, because they will be able to share … they have an orange, they have what else*
SG:
Mrs. Joshua: *what (laughing)*
Ss: *laughing*
Mrs. Joshua: *ok, so it helps ah, ah the learners even ourselves to share things equally and we also have, it enables the skill of measurement, ok, if they have to share things equally, sometimes we had to measure, we had to measure, so again fractions help us ah, ah the skill of measurement, that's for group one, lets clap hands for them*
Ss: *clapping*
Mrs. Joshua: *group three, group three, group three, quickly, quickly, quickly, quickly, quickly, this is group three*
SG1: *group one*
Mrs. Joshua: *this is group one*
SG: *six*
Mrs. Joshua: *group three, where is group three*
Ss: *laughing*

Mrs. Joshua: *group one we have it there, group two*
Ss: *this one*
Mrs. Joshua: *three, four, five, six*
Ss: *laughing*
Mrs. Joshua: *you are three so you were hiding (laughing), you said you are six*
SG3: *three*
Mrs. Joshua: & Ss*: laughing*
Mrs. Joshua: *ok, so lets have group four for the four will come, three will come after four, lets have group four*
SG4: *for the first one, for the first one, for the first one, share things equally, recognizing the part which is missing*
Mrs. Joshua: *what*
SG4: *for the first point*
Mrs. Joshua: *yes, yah I have got the first one, second point,*
SG4: *second point recognizing the part which is missing*
Mrs. Joshua: *(writing), is that all*
SG4: *yes*
Mrs. Joshua: *is that all*
SG4: *yah*
Mrs. Joshua: *ok, how do you recognize the part which is missing using the concept of fractions, how*
SG4: *lets assume that we have ten things of the whole, the what is missing, so we …. Have a fraction to ….*
Mrs. Joshua: *ok, so if you know the fraction you know something is missing, ok, lets clap hands for them*
Ss: *clapping*
Mrs. Joshua: *now lets have this group, quickly*
SG3: *point number one, learners will be aware how we can share things, skill of measurement*
Mrs. Joshua: *osangokopera za anzanu*
SG3: *no, laughing, no three, every whole thing can exist into a fraction*
Mrs. Joshua: *so why is that important? Ok, so point one and two are the ones which have already been given, lets clap hands for them*
Ss: *clapping*
Mrs. Joshua: *the remaining three groups, do we have points different from the ones on the board, yes*
SG2: *we only have one*
Mrs. Joshua: *yes*
SG2: *it helps learners to … the concept of operations in mathematics*
Mrs. Joshua: *(writing), calculating, any specific calculations*
SG2: *yah, if someone is told to add five to seven that means …. That type of five is*
Mrs. Joshua: *ok, any other point*
SG5: *yah, it helps learners to … with fractions*
Mrs. Joshua: *why is that important?*
SG5: *for example half, they were able to … with half*
Mrs. Joshua: *why is it important for them to know that this is half, why is it important*

SG5: *(silent), so that they can I think assist them with sharing*
Mrs. Joshua: *ok, so we have seen that it is important for us as well as for learners to know about! Fractions, it will help ah, learners to know how to share things equally, it helps them with the skill of measurement especially these two, the concept of division, its not that the whole concept of division, just part and it helps them …. It helps … ok, it helps in calculation, ok, so we can see that it is important for us to know fractions, even the learners themselves they have to know, to learn about (pause), fractions (rubbing the board, writing modeling fractions), modeling fractions …. Modeling fractions, how to find, how to model fractions (distributes pieces of paper to the groups), using one piece of paper, ok using one piece of paper can we fold that piece of paper into four equal parts, four equal parts*
Ss: *(folding in their groups, mathematics teacher educators standing in front)*
Mrs. Joshua: *then after folding, let's shade one part, lets shade one part (hanging the chart), lets shade one part just as I have done, what part of a fraction is the shaded part? Fraction of the shaded part is*
Ss: *one over four*
Mrs. Joshua: *(writing), so we have, the shaded part is one out of four parts, ok, so we have modeled one over four, how many parts should be shaded to model three over four*
Ss: *three parts*
Mrs. Joshua: *(writing three over four),, so to model three over four we should have this part shaded as well as this part (demonstrating using her chart), including this part, that means we have modeled three over!*
Ss: *four*
Mrs. Joshua: *four and can we model (writing one over five), can we model using other pieces of paper we had two pieces ah two papers, using the other paper can we model one over five*
Ss: students modeling in their groups
SG1: we have got a piece …. Into five equal parts (folding into five), so these are the five parts, five equal parts of paper, the we shade one part of the paper (demonstrating), so as I have done here, we shade one part of the piece of paper then we have four piece of papers remaining, so we have the fraction one out of five pieces of paper, its one, its one paper which is shaded out of five piece of papers
Mrs. Joshua: *ok lets clap hands for her*
Ss: *clapping*
Mrs. Joshua: *so we have had... Five …*
Ss: *papers*
Mrs. Joshua: *… Five parts so we have modeled ah one over five, so the same can be done in two over five, three over five, even five over five using the same procedure we can model any fraction, ok, are we together?*
Ss: *yes*
Mrs. Joshua: *so we have looked at one way of modeling fractions that is by coming up with … and shading them on the, there is another way which is by using (writes the number line), number line, by using ah the number line (changing the chart on the board), number line like the one at the board, but you can use any other number line, can we draw the number line, have you done that (walking around the groups), lets have two subdivisions, I said draw a number line should have zero, one two to whatever*

and have from zero to one just have two subdivisions, just two (drawing it on the board), two equal subdivisions, two equal subdivisions, ok, one fraction is each subdivision, from here to, we have from zero to one, we have how many total number of subdivisions, subdivisions are how many

Ss: *two*

Mrs. Joshua: *two ok*

Ss: *yes*

Mrs. Joshua: *total number of subdivisions here are one*

Mrs. Joshua & Ss*: two*

Mrs. Joshua: *ok, now if we just get one subdivision, what fraction is it of the whole*

Ss: *half*

Mrs. Joshua: *its one over*

Ss: *two*

Mrs. Joshua: *its half, are we together*

Ss: *yah*

Mrs. Joshua: *so in this way we have also modeled half, what, now from two to three or from one, one to two, ok can we have three equal subdivisions, three equal subdivisions, three equal subdivisions (moving around the groups), now if we have three equal subdivisions that means each division is*

Ss: *one over three*

Mrs. Joshua: *one over three, ok we have three equal subdivisions (demarcating the three), remember from here to here should be equal so just this subdivision is one over*

Ss: *three*

Mrs. Joshua: *and if you have two subdivisions*

Ss: *two over three*

Mrs. Joshua: *are we together?*

Ss: *yes*

Mrs. Joshua: *so that's another way of modeling fractions so lets just keep on studying there are many ways of modeling fractions, just have to study more, are there questions, is it clear, eh*

Ss: *yes*

S14: *Madam ….*

Mrs. Joshua: *first number line*

S14: *yah*

Mrs. Joshua: *we have our number line from zero to one ok that means the value from here to here is*

Ss: *one*

Mrs. Joshua: *one eti and I said can you divide it into two equal subdivisions, ok ndiye kuti should have zero here should have one and then, using a ruler, kuona kuti half ili part, ok, that means you had one division and have divided into two equal subdivisions, now if you get just one division, just one, … one over how many number of total subdivisions which is*

Ss: *two*

Mrs. Joshua: *so that means this one alone is half, ok or one over two, whichever, now the second one, the second one again was supposed to be zero to one only that because we are writing using a pen again from zero to one can have another one from zero to*

one and divide into three subdivisions, one, two, three, ok, now the total number of subdivisions is what
Ss: *three*
Mrs. Joshua: *three, just one subdivision is one over total*
Ss: *three*
Mrs. Joshua: *ndiye kuti from here to here is one over*
Ss: *three*
Mrs. Joshua: *ok*
Ss: *yes*
Mrs. Joshua: *are we together*
Ss: *yah*
Mrs. Joshua: *have I answered your question*
S14: *yes*
Mrs. Joshua: *ok, are there any other questions, ok so we have looked at definition of fraction how to name fractions, ok we have fraction over total number of … we have while its one over three we have, we have also … one third, ok, one over four is also known as one quarter, we can have two over four ok and then we have also looked at how to model fractions, ah using the number line as well as using …, so next time we will look at …. So if there are no questions can I have bottle tops, the pieces of chalk and paper we had (students handing in the aids),*
S15:
Mrs. Joshua: *yes, ok there is a question on writing of fractions, someone is asking, instead of writing one over five you write it*
S15: *one bar*
Mrs. Joshua: *like this*
S15: *no like this*
Mrs. Joshua: *can you come and do it at the board*
S15: *(writes it on the board)*
Mrs. Joshua: *just a flash*
S15: *yes*
Mrs. Joshua: *its advisable even to write it as this (writes), ok or if not just a straight line like that one with a slanting line not necessarily a slash, a slash like this, but this one is very … ok, not this one, ok, is it clear*
S15: *yah*
Mrs. Joshua: *rubbing the board*

MRS JOSHUA LESSON FOUR

Mrs. Joshua: *Good morning every one*
Ss: *good morning madam*
Mrs. Joshua: *how are you*
Ss: *fine and how are you*
Mrs. Joshua: *am fine, yesterday we started looking at types of fractions and so far we looked at two types of fractions, which are these, yes*
S1: *proper fractions*
Mrs. Joshua: *proper fractions*
Mrs. Joshua: *and improper fractions, what are proper fractions, yes, what are proper fractions yes at the back*
S3: *fractions whose numerators are smaller than the denominators*
Mrs. Joshua: *are fractions whose numerators are smaller than*
Ss: *denominators*
Mrs. Joshua: *what are improper fractions, yes*
S4: *these are fractions whose numerator is bigger or more than the denominator*
Mrs. Joshua: *so improper fractions are fractions whose numerator is equal or bigger than! The denominator, these are known as improper fractions, ok, so we have modeled some proper as well as improper fractions on the number line, not so*
Ss: *ummhu*
Mrs. Joshua: *ok, now using the same number line which we had yesterday, I hope you have brought that (hanging the chart on the chalk board), so we looked at proper fractions, which are from zero to ah, between zero and one, we said proper fractions are between zero and one on the number line and if are are from one going upwards on the number line ok*
Ss: *yes*
Mrs. Joshua: *now if you can ah the fractions from here ah from between one and, this means this is six over six, then*
Ss: *twelve over six*
Mrs. Joshua: *then*
Ss: *eighteen over six*
Mrs. Joshua: *up to*
Ss:
Mrs. Joshua: *from seven over six, we are going to divide ah denominator into the numerator, and write what you begin with, can we do that in our groups (students discussing in their groups), I hope you are through*
Ss: *yes*
Mrs. Joshua: *so here seven over six, we had!*
Mrs. Joshua:*:& Ss: one, one over six*
Mrs. Joshua: *next*
Ss: *one two over six*
Mrs. Joshua: *next*
Ss: *one three over six*
Mrs. Joshua: *and so on, now if you have a number like this one like one, one over six, where you have a whole number and a fraction a number comprised of a whole number and a fraction is known as a mixed*

Ss: *some say number some fraction*
Mrs. Joshua: *(writes mixed number), so yesterday we said we shall look at three types of fractions, the first two*
S5: *madam is a mixed number the same as fraction*
Mrs. Joshua: *it's a mixed number now ok, not a mixed fraction, it's a mixed number, we said we have three types of fraction ok, which we will look at, which we will look at, we looked at proper fractions, we looked at improper fractions and today we are looking at mixed numbers, ok, not mixed fractions, are we together*
Ss: *yes*
Mrs. Joshua: *but we are saying a mixed number is is a type of*
Mrs. Joshua & Ss: *fraction*
Mrs. Joshua: *are we together*
Ss: *yes*
Mrs. Joshua: *this number is our third type of fractions, ok*
S6: *is there a difference between a mixed number and a mixed fraction*
Mrs. Joshua: *what will be a mixed fraction, do we have a mixed fraction, some thing like a mixed fraction*
S7: *yes*
Ss: *no*
Mrs. Joshua: *like*
S7: *like that one, that one*
Mrs. Joshua: *no, that one is a mixed number*
Ss: *noisy (not clear)*
Mrs. Joshua: *this is a mixed number, its not a mixed fraction, how could the mixed fraction be like, if we say we have something like a mixed fraction*
SG: *two fractions*
Ss: *laughing*
Mrs. Joshua: *two fractions, like this*
Ss: *laughing*
Mrs. Joshua: *but we don't have something like that not so*
Ss: *yes*
Mrs. Joshua: *so we don't have something like that unless if there is a comma, to show that this is a fraction and that is a fraction*
S7: *ok madam, what we are trying to say is someone may be some of the teachers would tell us that is a mixed fraction*
Mrs. Joshua: *is it*
Ss: *yes*
Mrs. Joshua: *but according to what I have, to what I have read, according to what I have read, is a mixed number, not a mixed fraction, yah, so unless, even the …. Ones, these ones, its mixed number not mixed fraction*
S7: *ok*
Mrs. Joshua: *so may be lets study more, lets study more, we might discover something there but according to the books, according to the syllabus it's a mixed number, ok*
Ss: *yes*
Mrs. Joshua: *so when we talk of a mixed number, it is a number comprised of (writing the definition on the chalk board), a number and a fraction, for example (writes the*

examples as she speaks), five, one over two, three six over seven, and so on, a number and a fraction

S7: *should be comprised of a whole number*

Mrs. Joshua: *yes, yes, yes, thank you very much, comprised of a whole number and! A fraction, so its comprised of a whole number and a fraction, so a mixed number is a number comprised of a whole number and! A fraction, but we are saying that is a type of*

Ss: *fraction*

Mrs. Joshua: *a fraction, are we together*

Ss: *yes*

Mrs. Joshua: *so, so far we have looked at three types of fractions, proper fractions, improper fractions and*

Mrs. Joshua *& Ss:* *mixed numbers*

Mrs. Joshua: *not mixed fractions, ok (writing a section on the board) so we have changing mixed numbers to improper fractions, not changing mixed fractions to improper fractions, no, we have changing mixed numbers to! Improper! Fractions, now in our groups consider (writing on the board), consider the number two, four over five, ok, lets show two, four over five, ok lets come up with a number line, and not that number line, lets show two four over! (Students discussing in their groups) come up with a number line, and not that number line show two over! (Students discussing while the mathematics teacher educators moves around the groups), are you through*

Ss: *some say yes, some no*

Mrs. Joshua: *yes, can I have this is group, this is group, no this one, you are through*

SG: *no*

Mrs. Joshua: *(moving around checking the group that is through), ok, can we have the group at the corner there, to show us the number line, how you have come up with a number line, two ah, two four over five, yes, this group, group one*

G1: *one*

Mrs. Joshua: *yes, come and show us how you have come up with two, four over five (moving the chart on the board)*

SG1: *(draws a line, demarcating into parts) from zero to three (i.e. five parts) between zero and one, one and two, two and three and indicated two four over five as fourteen over five*

Mrs. Joshua: *ok yes any group with a different number line*

SG2: *(draws a line, label from zero to two, after two demarcated to five parts to three, then indicated one over five, two over five, three over five, four over five)*

Mrs. Joshua: *ok another group with a different number line or are the same (talking to another group) ok*

SG3: *(draws their line)*

S5: *students laughing*

Mrs. Joshua: *ok, time is not on our side from these number lines the demarcations from zero to three are the same, although they didn't use a ruler but you were supposed to use a ruler and even the distances should be the same and, when we are saying over five, that means you have five demarcations from zero to one whether ah from zero to one, you have five! Segments, ok, five segments, so that means, you should have, from here to here, these ones should be five, so as they are here, they are five, and if they are*

five from zero to one, that means, one part is, one segment is one over! Five of! One, ok. So here to here is four over five, ok, now up to here (that is one), this is five over!
Ss: *five*
Mrs. Joshua: *then as you proceed here and then ten over (at two)*
Ss: *five*
Mrs. Joshua: *up to whatever, but as I have already said our interest is on the number line, here (points to the second line), one over five iziyambira apa, from zero to one, but you can just have, sometimes chifukwa sukufuna kuti ulembe ma number ambiri, like here you can just write one over five, then just name here and here, name there what is …. Is here you indicate one over five, ok, like here (points to third number line), …. Imagine zikanakhala ten ndiye kuti zikanakhala chonchi one over ten, two over ten, so you can just have one over ten here kaya ikhala seven over ten, but as I have already said I want the emphasis is on the number line but remember one over five always starts here (points at the beginning of number line), ok, should be between zero and one, not between two and three, ok, ok now we have shown ah we said show two four over five on the!*
Mrs. Joshua & Ss: *number line*
Mrs. Joshua: *so as you can see two is where!*
Mrs. Joshua & Ss: *here*
Mrs. Joshua: *ok*
Ss: *yes*
Mrs. Joshua: *this is our two, now if to have four over five, then we should count, here we have one segment, two segments, three segments, four segments, so its here ok, … because you are between zero and one are we together*
Ss: *yes*
Mrs. Joshua: *so its here, so you can see that two four over five (writing), is also the same as two plus what (writing)*
Ss: *four over five*
Mrs. Joshua: *(writes) four over five, so using the number line as I said that two, four over five is just the same as two plus!*
Mrs. Joshua: *& Ss: four*
Mrs. Joshua: *over*
Ss: *five*
Mrs. Joshua: *ok, ok, now our idea is changing mixed numbers to!*
Ss: *improper fractions*
Mrs. Joshua: *improper fractions, so we are saying (rubbing), we are saying two, four over five is the same as! two four over five, now we have two plus four over five, ok, now we then change this two to (write on the board), would like to change just the same as we explaining but that fraction should be with the denominator!*
Ss: *plus*
Mrs. Joshua: *five, which is the equivalent fraction, according to the number line we have, our number line*
SG: *ten over five*
Mrs. Joshua: *ten over five, ok because where we had two was the same as ten over!*
Ss: *five*

Mrs. Joshua: *five, so two four over five, will just be the same as (writing) now ten over five plus four over five will give us what! Fourteen over five, so and fourteen over five is our improper fraction, we say we have to change this number to improper fraction, so one way of trying to change mixed numbers to improper fractions, is ah when you have three one over six that simply means, three plus*
Ss: *one over six*
Mrs. Joshua: *then have to find an equivalent fraction of three, which will have its denominator as! Six, ok*
Ss: *yes*
Mrs. Joshua: *and what fraction is that, what equivalent fraction is that*
Ss: *eighteen over six*
SG: *nineteen over six*
Mrs. Joshua: *nineteen over six*
SG: *no its eighteen (students debating between eighteen and nineteen)*
Mrs. Joshua: *an equivalent fraction which has the same value as three*
Ss: *still debating*
Mrs. Joshua: *no, my question was that what is an equivalent fraction equal to three, but there is a shorter way, instead of us having equivalent fraction we just multiply direct , ok so we can have three times*
Ss: *six*
Mrs. Joshua: *three times six plus*
Ss: *one*
Mrs. Joshua: *here is the same as two times*
Mrs. Joshua & Ss: *five*
Mrs. Joshua: *plus*
Ss: *four*
Mrs. Joshua: *but firstly, have to know that, that comes because of those equivalent fractions, is it clear, are there questions (rubbing the board), (writing a subsection), ok, so ah, now we shall move on to basic operations on! Fractions when we are talking of basic operations in mathematics we are talking about what*
Ss: *addition*
Mrs. Joshua: *addition, subtraction, multiplication and!*
Ss: *division*
Mrs. Joshua: *so we shall look at addition, subtraction, multiplication and division of! Fractions, now lets start with (write) adding proper fractions whose denominators are the same, adding proper fractions whose denominators are the same, so we have one over six plus! Three over! Six, in our groups, can we discuss how to model one over six, and three over six and then at the end come up with a solution, can we discuss that after looking at …. Of fractions and have five minutes for the (students discussing in their groups), I hope you are through, its time can I have representatives ah one representative, can you come forward, representatives group one, group two – represent or come forward up to group seven, group one to group seven, representatives come forward, can I have the rest here, you should be seven, who is your represantor, come forward, and that group can you come forward, bring whatever you are going to present, whose group is remaining, yes, so you have already started*

(referring to R1), no wait ok, so, and the rest of us lets see what our ah our friends have discussed, lets start with group one,

R1: *(writing on the board what they discussed and he goes)*

Mrs. Joshua: *can you explain what you have written*

R1: *according to what we have in our group, so far what we have managed to come up with is, as the instructions indicates that we have to add one sixth and three sixth by modeling, as you know we have been modeling fractions using a number line so we have thought it better to add two fractions again using ah a number line, and at the very first point time, first point time, we have to develop a number line and this number line we suggested that it should have two major compartments, that is the compartments from zero to one, and one to two and again we consider of now ah the first main compartment be subdivided into minor compartments whereby these compartments are fractions, the value of each compartment or each segment is one sixth, what am trying to say is from here to here is one sixth, the same from here to here and here to here onwards all these segments are representing the fraction one sixth, now in terms of addition we just shifted from zero to the first sub compartment which is taking us to one sixth now from there now we have taken three steps ahead from one and these three steps have been added to the very first single step which represents one sixth plus three sixth and when all these things are combined together as the arrow indicates here we concluded that the answer is four over six, that is so far what group one has done thank you so much*

Ss: *clapping hands*

Mrs. Joshua: *ok, so they are saying that, the one sixth, up to … so can we have group three but the explanation should be as quick as possible*

R3: *in group three we have modeled by shape, in our shading we, we were using ah this one*

MR LUKHERE – LESSON FOUR

Mr. Lukhere: *lets continue from where we stopped (putting a chart on the chalk board) that's ah skills that is three or four skills, the first one is going to be changing mixed numbers to improper fractions, that is we have to change these numbers to improper fractions, which are similar or the same denominators, then addition of proper fractions with different denominators, we will start with changing mixed numbers to improper fractions. Ah (reading from the chart), consider the mixed number two, four fifth, ah the activity says, lets use a number line, lets use a number line, to show that, two four fifth is equal to two plus four fifth, now two plus four fifth, we are doing that activity together as a class … any volunteer, show that two four fifth is equal to two plus four fifth (while pointing to the chart using the chalk board ruler), using a number line, yes*

S1: *(drawing the number line on the chalk board using the ruler, dividing it into two equal pars, then divide the distance between zero and one into five parts the same with the distance between one and two but failed to label the parts)*

Mr. Lukhere: *yes*

S2: *(rubbed the number line by the first and drew his and divided into three then each part divided into five sections), from here to here is one, such that these are small parts, small ones which are forming one, so two here and here, so from here to here, its one and from here, here, here, ….*

Ss: *laughing*

S2: *from here to here we have formed five parts (referring to between two and three) but the question says four over five, so count from here, one, two, three, four, so this point here is giving us two, four over five.*

Mr. Lukhere: *any different view (salience), anyway he is correct three are about five subdivisions between zero and one, similarly there are five subdivisions between one and two, and five subdivisions between two and three, now since we have a total number of five, then the first one must represent the fraction of one! Fifth, the next one, two fifth, three fifth, four fifth because the distance from this, this one and this one is only one similarly between two and three its what*

Mr. Lukhere & Ss: *one*

Mr. Lukhere: *therefore our case is two four fifth, show that two four fifth is equal to two plus four over five, so this is our two and there we label ah this point as four fifth that is if we are considering points ah between two and three, therefore this two plus all these up to this point is just the same as, what is given as two four fifth, that's the way to use a number line to show that two four fifth is equal to two plus four fifth, now next statement says, change the whole number two to a fraction with denominator five (reading from the chart), why should we change the whole number two, that's this number to a fraction, or equivalent fraction with denominator five, why should we change that, why, change the whole number two referring to this two, to a fraction with denominator five, why should we use a denominator five and not any other denominators in this case, yes*

S3: *because there are five subdivisions up to one*

Mr. Lukhere: *five subdivisions making one, not really, of course he is correct but actually we are looking at the denominator of this fraction, the denominator of this fraction is five and therefore we need to come up with an equivalent fraction of two with*

a denominator of five, and this is ten over what! Five, what has happened to change two to ten over five, how have we changed two to ten over five, yes

S4: *may be we have multiplied two by the denominator five*

Mr. Lukhere: *two by the denominator five, yes (pointing at a student)*

S5: *I think we have multiplied two by five subdivisions*

Mr. Lukhere: *no, what we have done there is, its, actually two over one (writes), eh so we want to change this one to an equivalent fraction but that fraction must have a denominator of five , so we have to multiply the numerator and denominator by five, so we have to multiply the numerator and denominator by this five, when we do that (writing steps involved), when we do that we get ten over five, so next replace two with ten over five because these are simply equivalent fractions, so replace two with ten over five in two plus four over five, that is this one and end up with ten over five plus four over five, and then since ah, denominator is the same we end up with ten plus four over five, which is fourteen over five, anyway that is one way of changing numbers, changing mixed numbers to improper fractions, however there is a shorter way of doing that, all you are supposed to do with your pupils, is (writing two over five), you multiply the whole number with the denominator the product that you find must be added to the denominator and the denominator is going to be maintained, so have something like five times ten*

Ss: *ten*

Mr. Lukhere: *ten, and then ten plus what (writing)*

Ss: *four*

Mr. Lukhere: *four over*

Ss: *five*

Mr. Lukhere: *you simply get something like fourteen over five (while adding another chart on top of the other), ok addition of proper fractions whose denominators are the same, addition of proper fractions whose denominators are the same,(heading of the chart) consider the following addition problem that is one plus one over five plus three over five (reading from the chart), model the addition process as follows, that is to say when we are trying to teach addition of fractions, we normally start with simpler things which pupils can appreciate, that is, they can easily see that is why there is need for us to model the addition of these fractions, and to do that we are going to use a rectangle with eh some subdivisions and for this sum of one over five plus three over five, first of all there is need for us to model the addition process as follows, draw a rectangle as I have done this one (pointing to the rectangle), it has to be a rectangle or a circle, divide that rectangle into ah five equal parts as shown below, by dividing this rectangle into five equal parts, because of the denominator, that we are using in this addition then model the fractions one fifth and three fifth how have we modeled the fractions in this case, I have modeled one fifth by shading this different from ah three fifth which is these three parts and then out of the five parts, one part has been modeled as one fifth, which is this one, three parts has been modeled which represent that fraction (pointing to three fifth) and then when we add the total number of parts which have been shaded we end up with one, two, three four out of how many parts!*

Ss: *five*

Mr. Lukhere: *five, so that's the way we can model the addition of fractions whose denominators are the same, however looking at the denominator a common the same*

denominator for the two fractions, there is one simple way of adding fractions, who can guess, who knows, instead of going through this process of modeling addition of fractions, what's the simplest way of adding these fractions, yes

S6: *(going to front), we just ah common denominator is five (writing the sum again), with the common denominator we take five into five we get one (writes it), plus other denominator, five into five we get three*

Ss: *one, one*

S6: *sorry, yah five into five we get one and multiply by three coming up with three, the answer is four over five*

Mr. Lukhere: *anyway he is correct but he has gone too far, that is not the one I was looking for, the issue here is the denominators are the same eh*

Ss: *yes*

Mr. Lukhere: *so, one that is supposed to tell the pupil is just add the numerators eh*

Ss: *yes*

Mr. Lukhere: *and maintain the*

Mr. Lukhere & Ss: *denominator*

Mr. Lukhere: *so this is going to be equal to one plus*

Ss: *three*

Mr. Lukhere: *over*

Ss: *five*

Mr. Lukhere: *not necessarily making divisions, so this is four over*

Mr. Lukhere & Ss: *five*

Mr. Lukhere: *just add the numerators, while maintaining the*

Mr. Lukhere & Ss: *denominators*

Mr. Lukhere: *that's addition of proper fractions whose denominators are the same that's what is supposed to … calculations will come later own, using the same procedure for modeling addition of fractions, may I have one volunteer to model the addition of four fifth, sorry four seventh plus two seventh (writing on the board, model using the number line the following 4 over seven plus two over seven) for those two fractions, ladies I cant see you, are you here, ahh*

Ss: *yes*

Mr. Lukhere: *yes*

S7: *going to front and draw a straight line*

Ss: *ah, number line*

Mr. Lukhere: *I have said using a number line*

Ss: *yes*

Mr. Lukhere: *no it's a (writing addition of instead of number line), am sorry , you are not restricted to use a rectangle only, could use triangles, could use circles*

S7: *(drawing a circle, dividing into seven parts), first we are going to draw a circle, then we divide it into seven parts after that we shed four parts (shading the four parts) and this part represents four over seven (writing as she speaks), then we shed two other parts (shading two), and these two parts represent two over seven (writing while speaking), after that we are going to count from all, we are going to count all parts that we have shade, one, two, three, four, five, six, that means (writing equal to sign), two over seven plus four over seven is equal to six over seven (writing six over seven) that's all*

Mr. Lukhere: *any observations, one with the circle*
Ss: *not clear*
Mr. Lukhere: *what*
S2: *the parts were not equal*
Mr. Lukhere: *the parts were not equal aha, that's true, eh some sections were bigger than others eti*
Ss: *yes*
Mr. Lukhere: *what else do you notice, was the shading clear*
Ss: *yes*
Mr. Lukhere: *I mean were you able to notice the demarcations*
Ss: *yes*
Mr. Lukhere: *here can you notice the demarcations*
Ss: *some say yes some no*
Mr. Lukhere: *I cant see may be I need glasses, ok otherwise apart from those observation, that's how we are supposed to model additions of fractions, that us whose denominators are the same, next lets consider addition of proper fractions whose denominators are different, what is involved (hanging the chart on the board), consider the problem one third plus one quarter. Lets identify the equivalent fractions of one third and one quarter, in other words we are going to add these fractions using our knowledge of equivalent fractions, so what are the equivalent fractions of one third then what are, what is the equivalent fraction of one quarter that when changing these two numbers to their equivalent fractions, the numbers that we are going to find must have same denominator, are we together?*
Ss: *yes*
Mr. Lukhere: *now what should we multiply to this fraction (pointing to one third), as well as that fraction to come up with the same denominator, yes*
S8: *twelve*
Mr. Lukhere: *by twelve, multiply by twelve, is that correct, lets try it, one third by twelve*
S8: *yes*
Mr. Lukhere: *(solving it on board), no that is not correct, yes*
S9: *(not clear)*
Mr. Lukhere: *by what*
S8: *three*
Mr. Lukhere: *it doesn't really mean that the same number must multiply those two fractions can be different numbers eti, what should we use, yes*
S1: *multiply one third by four and one quarter by three*
Mr. Lukhere: *first one by*
S1: *four*
Mr. Lukhere: *and the other one by*
S1: *three*
Mr. Lukhere: *so we have one third by four (writing), to get four over twelve (writing), then one quarter by three (writing), to get what (writing)*
Ss: *three over twelve*
Mr. Lukhere: *three over twelve*
Ss: *yes*

Mr. Lukhere: *so that's ok, ummhu, that's what is supposed to happen ah in other words, the simplest way to identify the numbers to multiply with is for the first fraction multiply with the denominator of the second fraction, and then for the second fraction multiply with the denominator of the first fraction, so you must be able to find four over twelve and three over twelve, next replace the original one third by four over twelve and one quarter this one by three over twelve in the addition problem, and this is what is supposed to look like, in this case we have the same denominator as was the case with the addition of proper fractions with the same denominator, example we have just discussed, so next thing is for us or for you with your pupils to add the numerators and maintain the denominators to arrive at the answer as follows, that is four over twelve plus three over twelve to have four plus three over twelve to get seven over twelve, that's how you are supposed to add addition of proper fractions whose denominators are (refers to his notes) …. Which I think involves a bit of calculations, where to use LCM, that is lowest common multiple, using the same example, may I have a volunteer, once again to demonstrate to us how to add (writing one third plus one quarter) the two numbers using lowest common multiple of the two denominators of the fractions, yes,*

S9: *we are going to add these two numbers using eh, lowest common multiple, therefore what to do first is to write this bar (writing the bar), and find the lowest common multiple of these two denominators then we are having three and four, what we have to do is this, we have to multiply these denominators three and four, when we multiply this three and four we get*

Ss: *twelve*

S9: *twelve (writing) then we are now to add these two fractions when using the lowest common multiple as our denominators what we do is since we are having these two different denominators at first take this three divide it into twelve then we multiply the result by the numerator and we write it at the top of the bar, then when we divide three into twelve what do we get*

Ss: *four*

S9: *the same four (writing four), then we also divide four from twelve*

Mr. Lukhere: *four from twelve? Four into twelve*

S9: *yes, we divide four into twelve, what is the quotient*

Ss: *three*

S9: *then we have three, then what is our sign here*

Ss: *plus*

S9: *not multiplied but addition sign, therefore what is the next thing is to add the numbers since we are having our denominator, our denominator as twelve, what is the sum*

Ss: *seven*

S9: *seven (writing seven), then our denominator is?*

Ss: *twelve*

S9: *twelve (writing twelve), seven over twelve is our answer*

Mr. Lukhere: *I think that correct*

Ss: *yes*

Mr. Lukhere: *yah, apart from these fractions we can use our knowledge of lowest common multiple to add fractions as has been seen that one (hanging another chart), next lets consider the addition of mixed numbers whose denominators are the same,*

consider this addition problem that is one two fifth plus two one fifth, remember the addition of mixed numbers whose denominators are the same, ah what one is supposed to do is first of all one is supposed to add the whole numbers first on their own, so we have one plus two is equal to three and then add the fractions on their own, and these fractions have the same denominator so we simply add the numerators, so we have three over five, thereafter add the sum of whole numbers and the sum of fractions, so the sum of whole numbers is three which is this one sum of fractions is three fifth which is this one, so when you add, you get this one three and three fifth, three and three fifth. Apart from that you can also use the idea of improper fractions, how can we use the idea of improper fractions, change these numbers to improper fractions that is one two fifth becomes, seven over five, you know what happens

Ss: *yes*

Mr. Lukhere: *this has already been discussed, and then two, one fifth becomes eleven over what! Five, then re write the problem using improper fractions we have one two fifth plus two one fifth which becomes seven over five plus eleven over! Five and then add the numerators and maintain the!*

Ss: *denominators*

Mr. Lukhere: *because the denominator are the same, and we get eighteen over five, lastly this must be changed to a mixed number, that is to say five into eighteen we get three, three fifth, we get three, three fifth (refer to his notes)*

S10: *Sir*

Mr. Lukhere: *yes*

S10: *I have an observation, ah one two over five plus two, one over five and if we add the whole numbers …. The, the, the fractions to say that*

Mr. Lukhere yah that is what we have done in the first place, here, it was the whole numbers first one plus two, which is this sum we have three, then the next the fractions second, and we ended up with and then these are added, these are the skills you are supposed to use in early stages when teaching addition of fractions because then our pupils will not have …. Skills involved in …. However emphasis must be put, on this condition that say the denominators must be! The same, is that one clear

Ss: *yes*

Mr. Lukhere: *in other words one can spend may be three days, four days just discussing the addition of proper fractions whose denominators are! The same, so that pupils are able to familiarize themselves, before moving something ah, difficult, ah that is where one is supposed to use may be the lowest common multiple (writing the problems to be done in class) ok, I will need two volunteers, the first one to demonstrate the addition of three two over nine plus one, three over nine, an example has not yet been discussed (removing the charts on the board), in this class, all the same, will require someone who has been … enough ah to demonstrate how we can add addition of mixed numbers whose denominators are different, so we start with the first one, a volunteer, yes*

S11: *(copying the sum) at first we are going to add the whole numbers, three plus one,*

Ss: *four*

S11: *(writing three plus one equal to four)*

Mr. Lukhere: *remember to face the audience*

S11: *what*
Mr. Lukhere: *remember to face the audience as you speak*
S11: *at first we are going to add the whole numbers, three plus one*
Ss: *four*
S11: *and then we are going to find the common denominator of nine, what is the common denominator of nine and nine*
Ss: *nine*
S11: *nine into nine*
Ss: *one*
S11: *one times two*
Ss: *two*
S11: *(writing two), nine into nine*
Ss: *three*
S11: *one times three*
Ss: *three*
S11: *(writing three), nine into nine is equal to one and one times two is equal to two, and nine into nine is equal to one and one times three is equal to three, and we are going to add (writes five), two plus three*
Ss: *five*
S11: *over nine, and four is the whole number so we are (writes three),*
Ss: *four, four*
S11: *(changes three to four) and the answer is four, five over nine*
Mr. Lukhere: *is that four, five over nine*
Ss: *no*
Mr. Lukhere: *is that five, is that four, five over nine*
Ss: *noisy, some say no some say yes*
Mr. Lukhere: *what is wrong?*
Ss: *noisy*
Mr. Lukhere: *yes*
S12: *goes to front and changes*
Ss: *laughing*
Mr. Lukhere: *some more corrections? Yes*
S13: *rubs and write hers (some students laughing)*
Mr. Lukhere: *at least*
Ss: *yes*
Mr. Lukhere: *then what sort of numbers do you write in your with these simple mistakes, how do you write fractions, take care, otherwise pupils will be copying the same, they will be copying the same things you wrote, ok, ah of course the method that she has used is a bit advanced, I thought she was going to add the whole numbers separately and then fractions, what*
Mr. Lukhere: *& Ss: separately*
Mr. Lukhere: *but she has combined both, its correct anyway, but I wished she used the addition of whole numbers separately and addition of fractions separately, another one demonstrate addition of that, please start from simplest to difficult, eti*
Ss: *yes*

Mr. Lukhere: *so when she was demonstrating the addition of mixed numbers with different denominators, start with the most simple method that is easy to understand … oh this time I will chose non-volunteers*
Ss: *laughing*
S14: *first we are going to add the denominators, so its six plus one*
Ss: *whole numbers*
S14: *whole numbers, sorry, (writes equals seven), secondly we are going to add the numbers (writes four plus one equals five), then we are going to maintain the, ah sorry*
Ss: *laughing*
S14: *we are going to find factors of five and two, that will be ten, then five into ten*
Ss: *two*
S14: *then two times four*
Mr. Lukhere: *is she doing the right things*
Ss: *no*
S14: *(rubs and stars all over), six times one (writes seven)*
Ss: *laughing, factors of five and two (writes ten), ten into, five into ten*
Mr. Lukhere: *I don't want that method, I want the one where we started with the addition of whole numbers separately and then you deal with fractions separately, that's what am looking for may be some one should try*
S14: *rubs the board and goes to sit*
S15: *add six plus one as whole numbers (writes six plus one) the we are going to get seven (writes equals seven), from there we are going to add the fractions, four over five (writes it), plus one over two (write is), first of all let us consider the denominators, whenever we divide by five can go into it without a remainder, and two can go into that without a remainder, what is the number?*
Ss: *ten*
S15: *(write ten), five into ten*
Ss: *two*
S15: *two times four*
Ss: *eight*
S15: *(writes eight), five plus eight*
Ss: *thirteen*
S15: *(writes 13), over ten eti*
Ss: *yah*
S15: *here we have got thirteen over ten, what next*
Ss: *laughing*
S15: *let us simplify thirteen over ten, ten into thirteen*
Ss: *one*
S15: *(writes one), we remain with*
Ss: *three*
Mr. Lukhere: *can you rub off the other part*
S15: *(rubbing), we remain with three and our denominator is going to be*
Ss & S15: *ten*
S15: *then we are going to add seven plus*
Ss: *one*
S15: *(writes seven plus one) which is*

Ss: *eight*
S15: *(writes eight), and three over ten this is the answer*
Mr. Lukhere: *is that correct*
Ss: *yes*
Mr. Lukhere: *what about where one is supposed to use ah the addition of whole numbers separately and then addition of fractions separately using the idea of equivalent fractions, yes white shirt, yourself, yes*
S16: *(copying the sum again), ok ah first of all we are going to add the whole numbers which are six and one (writing six plus one) to get seven (writes equals seven), then we are going to add the fractions, so four over five plus one over two (writes it), because we want to add these fractions using ah equivalent fractions then we are going to find ah the number whereby that number as a common denominator. So we are going to multiply five by this fraction and again we are going to multiply this fractions by two so it will be four over five added to one over two multiply by five over five (writing all this)*
Mr. Lukhere: *anyway ah in the interest of time you can stop there, so you will be the first to demonstrate tomorrow*
S16: *ok*
Mr. Lukhere: *thank you*

MR LUKHERE – LESSON 5

Mr. Lukhere: *ok, ladies and gentlemen (writing the topic on the board addition of mixed numbers with different denominators), ah yesterday we were looking at addition of mixed numbers with different denominators, and we have not yet finished the extension on working out this problem that was (writing 6, 4 over 5 + 1, 1 over 2), six, four fifth plus one and half, now let me just, let me quickly go through it, ah together with you, first thing that we are supposed to do in trying to teach the addition of mixed numbers with different denominators is to add the whole numbers, when we add the whole numbers, we will have our seven (6 + 1), is that right,*

Ss: *yes*

Mr. Lukhere: *next we must add the fractions and these are proper fractions with different denominators, therefore there is need for us to use the idea of equivalent fractions, we must come up with equivalent fractions of what has been given (writing on the board), so you need to identify equivalent fractions of four over five and half (writing what he says simultaneously), now what are the equivalent fractions to those two and explain how you get them, yes*

S1: *we must multiply the denominators by of each fraction by the denominator of the other*

Mr. Lukhere: *is he correct*

Ss: *no*

Mr. Lukhere: *yes*

S2: *we have to multiply the first fraction both numerator and denominator by two then second fraction to be multiplied by both denominator and numerator by five.*

Mr. Lukhere: ok the first fraction which is four fifth, multiply both the numerator and the denominator by two, this fraction we also multiply the numerator as well as the denominator by five, so we have four by five times two, times two, to get eight over ten plus five down ten (writing on the chalk board),. This time around we have the same denominators therefore just have to add the numerators which will give us thirteen down what

Ss: *ten*

Mr. Lukhere: *thirteen over ten and that five the mixed number will be one, three over ten, so this must be further added to what has been found earlier upon and therefore we end up with that is adding the two answers (writing), we are going to have seven plus one and three tenth to get eight three tenth (writing), eight and three tenth, that is addition of mixed numbers using different denominators apart from this, that is apart from the use of equivalent fractions we can also add mixed numbers with different denominators using the idea of lowest common multiples (rubbing off the board leaving out the topic and the sum), now how can we use lowest common multiples to find the sum of those two fractions? Any demonstration, that's, aha, we are not being gender sensitive, yes, using the lowest common multiple*

S2: *ok, first step we want to add the whole numbers and then fractions, therefore we have got six plus one the answer will be*

Ss: *seven*

S2: *(writing seven), and let us find the common denominator which five and two can go into that number without leaving a remainder, yes*

S3: *its ten*

S2: *therefore this ten will be our common denominator (writes), then lets take five into ten, how many times can five go into ten without leaving a remainder*
S4: *two*
S2: *that two should be multiplied by our numerator four and the answer will be*
Ss: *eight*
S2: *(writes 8), it will be eight plus, two into ten*
Ss & S2: *five*
S2: *this five times one*
Ss: *five*
S2: *(writes 5), equal to, our whole number is seven, now let us add eight to five, what will be the answer*
Ss: *thirteen*
S2: *thirteen (writes 13), over ten which is equal to, because we have got the numerator, we have got the numerator, which is bigger than our denominator, so we have to take this denominator into the numerator, it goes how many times*
Ss: *one*
S2: *this one should be added to the whole number seven, the answer will be*
Ss & S2: *eight*
S2: *(writes 8), now we have got remainder, we have remained with! Three because we have taken ten into thirteen to give us one (writes 1)and thirteen minus ten the remainder will be!*
Ss & S2: *three*
S2: *this three will be our numerator over denominator ten, this is our answer (writes the answer)*
Mr. Lukhere: *its clear,*
Ss: *yes*
Mr. Lukhere: *ok, and the other option, the same problem is to use improper fractions, that is to say, you can change these mixed numbers to improper fractions and then do your additions, however ah that case you still have to use may be the knowledge of lowest common multiple or equivalent fractions (rubbing the board including the topic), lets move to subtraction of numbers and we start with the proper fractions (writing the topic on the board i.e. subtraction of proper fractions with the same denominator), (writes the question and then he reads it) Demonstrate the subtraction of five over six minus three over six, five over six minus three over six, anyone who can use the diagram to explain that subtraction, ah, yes*
S5: *(draws a rectangle on the board and divides it into six parts), ok ah our statement says subtract five over six minus three over six, so here I have this one divided into six categories, so first of all we have these parts (shades five parts of the rectangle), this shaded part represents five over six as we already ah learnt, ah in the previous lessons and they are saying we should take three over two from five over six, so if we take three from here (pointing the shaded area), lets take one, two, and three, so this part represent three over six while this part represent five over six. So if we take three over six from five over six we will remain with these two which is two over six, which is this whole part, so we will remain with this part which is two over six, so our answer will be two over six (writes it on the board), thanks*

Mr. Lukhere: *thank you, that is correct, we have the five parts, out of the five parts you remove, get away three parts (pointing to the rectangle), so you will remain with two parts, that's two over six, take note that you are not restricted to use ah a rectangular diagrams only, rectangular diagrams only, you can use also circular € papers, is that correct*

Ss: *yes*

Mr. Lukhere: *you can also use circular ah diagrams, however in short to subtract fractions with the same denominators (writes the problem again), all one has to do is to subtract the numerator while maintaining the denominator. So in this case (writing equals sign) when we subtract the numerators we get what*

Ss: *two*

Mr. Lukhere: *over what*

Ss: *six*

Mr. Lukhere: *so just subtract the numerators while maintaining the denominators, (refers to his note book, then rubs on the board leaving the topic and replacing the word same with different on the topic), ah the approaches that we used when we were adding fractions also do apply to subtract of fractions in most cases, therefore I believe the discussion of subtraction of fractions will not take us long simply because we will be using the same knowledge that we were using in addition of fractions, now I will give the problems which you must do in your groups ah five minutes you do the discussions thereafter you will have to make presentations, right here, different groups will be given different tasks, where is group one*

G1: *here*

Mr. Lukhere: *group one question is discuss how you can teach, discuss how you can teach addition, sorry discuss how you can teach subtraction, how you can teach subtraction of proper fractions, with different denominators, ah how you teach subtraction of proper fractions with different denominators, group two, where is group two*

G2: *here*

Mr. Lukhere: *ah discuss how you can teach subtraction of mixed numbers with the same denominators, subtraction of mixed numbers with the same denominators, group three, subtraction of mixed numbers with different fractions, group four, discuss how you can teach the following subtraction this is the special one subtraction of four (writes on the board 5 one over 9 – 2 two over 3), discuss how you can teach the subtraction of that mixed number, I will give you five minutes for the discussions, if you have questions let me know so that I can clarify ….*

Ss: *students discussing in groups, - noisy of chairs, most use Chichewa for discussion*

Mr. Lukhere: *your points must be logical for … so that one will represent to the class, it must be known to unknown, from simple to difficult*

Ss: *students continue discussions*

Mr. Lukhere: *refers to a group – any questions for clarifications, (to the whole class), take note that whoever is going to do the presentations its not simply the question of making calculations, no, but explain to your pupils in language they can understand, at the same time ah take them from one step to another*

Ss: *students continue their discussions*

Mr. Lukhere: *ok, I think you are through, have you finished*
Ss: *no,*
Mr. Lukhere: *(after a while), ok, ah time for discussion is over, its time for presentations, group one, group one, group one, and in your groups, it should not be the same people making presentations, it should not be the same people making presentations, some of you shun away from these presentations, don't, otherwise you will not be good teachers, ok ah, lets maintain silence and listen for group one*
SG1: *we were supposed to subtract, to subtract fraction of*
Mr. Lukhere: *speak up*
SG1: *first of all we have to find equivalent fractions of the two numbers (writes the subtraction of two numbers on the board) which are going to be half multiply by three and three again for the numerator and denominator, the equivalent will be three over six, and for the one third we are going to multiply by two which is going to be two times one and down here three times two, which is going to give us, two, one times two*
Ss: *two*
SG1: *two, over three times two*
Ss: *six*
SG1: *six, so here you can see that our denominator now have become the same, and at this point we just subtract the numerators and maintain the denominator and our next step will be, here, down here we write six, up here we write three minus two, three minus two is equal to*
Ss: *one*
SG1: *and down here we write six and one sixth is going to be our answer*
Mr. Lukhere: *thank you, ah what group is that*
G1: *one*
G2: *two*
Mr. Lukhere: *what*
G1: *one*
G2: *two*
Mr. Lukhere: *I mean that is group two*
G2: *yes*
Mr. Lukhere: *can you, can you present your findings, and what task was given to you*
G2: *subtraction of mixed numbers with the same denominator*
Mr. Lukhere: *with the same denominator*
G2: *yes*
Mr. Lukhere: *ok*
SG2: *according to our group we have been given the problem concerning subtraction of mixed numbers with the same denominators, from the problem, the problem is as follows (writes it on board, 3 two over half – 2 one quarter), so first of all we should have to subtract the whole numbers, whole numbers. So our whole numbers here, firstly we have three (writes it), and the second one we have two, so we have subtract these whole numbers, three minus two*
Ss: *one*
SG2: *one (writes it), and thereafter*
Mr. Lukhere: *what is , is that one?*

SG2: *one (rubs and write it the teachers way), and there after we are going to deal with the fractions, as we have been told we have the same denominators, so we are going to deal mostly with the numerators, so our numerators are two (writes (2 – 1)/4), we are doing this just because we have the same denominators here, that's why we have come up with the single denominator from two, so as I have already said , we have to subtract one from two, so two minus one*
Ss: *one*
SG2: *so is equal to one down four here then we are going to take one here and ah going to be together with this one, it simply means we are going to collect this one and come up with one and one quarter here*
Mr. Lukhere: *are we adding or what*
SG2: *the*
Mr. Lukhere: *together is what*
SG2: *we are just collecting this one*
Mr. Lukhere: *ummhu*
SG2: *to go, be with one quarter here*
Mr. Lukhere: *are you adding or doing what*
SG2: *here, some how is like*
Ss: *laughing*
SG2: *adding*
Mr. Lukhere: *adding eh*
SG2: *yes*
Mr. Lukhere: *it's supposed to be adding*
SG2: *yah so we are going to have, to come up with one and one quarter, so our answer is this one, one and one quarter, thank you very much*
Mr. Lukhere: *thank you, ah I am very much interested in that question, five one nine minus two, two third, what group has been given that, oh two groups, we start with that last group, please assume ah, may be you should assume that we are pupils and not colleagues*
SG5: *(writes five one over nine minus two two thirds), ah here we are going to change the mixed number to improper fraction, here we are going to multiply nine by five, what is our answer*
Ss: *forty five*
SG5: *forty five plus one*
Ss: *forty six*
SG5: *(writes it) three multiply by two*
Ss: *six*
SG5: *six plus two*
Ss: *eight*
SG5: *ah is that true, nine multiply by five*
Ss: *forty five*
SG5: *forty five?*
Ss: *yes*
SG5: *plus one*
Ss: *forty six*
SG5: *(checking with her notes), yah over nine yah*

Ss: *laughing*
SG5: *three multiply by two*
Ss: *six*
SG5: *six plus two*
Ss: *eight*
SG5: *eight over nine*
Ss: *ah three*
SG5: *oh, no over three, sorry, here we are going to find the LCM of nine and three, what is our LCM*
Ss: *nine*
SG5: *(writes 9), nine into nine*
Ss: *one*
SG5: *one multiplied by forty six*
Ss: *forty six*
SG5: *(writes 46), three into nine*
Ss: *three*
SG5: *three, multiplied by eight*
Ss: *twenty four*
SG5: *(writes 24), here we are going to subtract twenty four from forty six, what is our answer.*
Ss: *22*
SG5: *is twenty two of nine (writing), now we are going to change this improper fraction into mixed number, we are going to divide nine into twenty two, nine into twenty two, what is our answer*
Ss: *two*
SG5: *(writing two), remainder*
Ss: *four*
SG5: *(writing four over nine), this s our answer, that's all*
Mr. Lukhere: *thank you, still more the same problem ah, I want you to teach the same problem without necessarily changing the mixed number to improper fractions, and without changing the fractions to equivalent fractions, ha, use LCM lowest common multiple to subtract these fractions without the use of equivalent fractions as well as without the use of improper fractions, right (checking what the other group wrote), ok, which group are you, yes, because there is something that am looking for in that, something to do with regrouping, that is what am looking for*
SG4: *in our group we have written the same some, which is (writes it on board), we have given this sum, so in order for us to do this sum, it will be very difficult, so first of all*
Ss & Mr. Lukhere: *laughing*
SG4: *first of all we should solve ah, the, ah (refers to his notes)*
Ss: *whole numbers*
SG4: *whole numbers first, the, the fractions second, so first of all five ah minus two*
Ss: *three*
SG4: *(writes three), then ah we have to find ah the common factors of nine and three, which is nine (writes 9),*
Mr. Lukhere: *use your … when necessary*

SG4: *nine, so nine go into nine and three should go into three, three should go into nine, how much*
Ss: *laughing, one*
SG4: *it will be one, so one times one*
Ss: *one*
SG4: *(writing one), two into nine*
Ss: *aaaah, aaah, three, three*
SG4: *yah three, three times two*
Ss: *six*
SG4: *(writes 6, the refers to his notes), so ah we have one minus nine, ah one minus six down nine, so ah, we, so for us to solve this sum it will be difficult, so one minus six, so we will, we will, we are going to have two then for nine, for one minus six, it will be nine plus one minus six over nine*
Mr. Lukhere: *would you repeat the explanation there, it should be as clear as possible*
SG4: *ok, three, one minus six over nine, so one minus six, its what*
Ss: *impossible*
SG4: *it will be impossible, so we are going to borrow one from three, from the whole number three and it will be, when we borrow one from the whole number three and it will be the same as the denominator, so our denominator is nine, so we are going to have nine, nine plus one, nine, nine which we borrow one from the three and plus one, which is, which is, then numerator, minus six it will be two, nine, one minus six over nine*
Ss: *yah*
SG4: *we have two, nine plus one*
Ss: *ten*
SG4: *(€writes ten), ten minus six over nine, our two, ten minus six*
Ss: *four*
SG4: *four over*
Ss & SG4: *nine*
SG4: *this is our answer*
Ss: *clapping hands for him*
Mr. Lukhere: *ok, its correct, isn't it*
Ss: *yes*
Mr. Lukhere: *believe you me, some of you on your own you couldn't have managed to solve this problem using this problem*
Ss: *yah*
Mr. Lukhere: *aha*
Ss: *yes*
Mr. Lukhere: *so can you imagine, if you fail, if you are failing to do that, what about your standard five pupils, ha, we should expect lots of problems aha*
Ss: *yes*
Mr. Lukhere: *so when dealing with a problem of this nature you have to be clear as possible, what happened here is, he got one from three, and this one has how many things*
Ss: *nine*

Mr. Lukhere: *this one which has been taken from three has nine things, that is why ah, ah, we had to add one with nine there to get ten minus six and then, since we have taken one from there that's why we are remaining with two as a whole number and then subtract to get four and the answer becomes two, four over nine, questions? Any questions on that one, however to run away from problems of this nature, from problems of regrouping, people normally opt to use improper fractions, you simply have to change these two whole numbers to improper fractions, when you do that, you have run away from issues to do with eh, eh, regrouping, ok if you don't have questions, I think its almost time up we meet on Monday have a glorious weekend*

Ss: *thank you*

MR CHIPASULA – LESSON 4

Mr. Chipasula: *apart from these five, any addition to the list you had, three or more … so it can't be only these five, ummhu*

S1: *basic multiplication facts*

Mr. Chipasula: *(writing ob the board), basic multiplication facts, another one that's all so we have one two three four five six, what about this one, the second one, place value chart, could it be necessarily place value chart (pointing to a student)*

S2: *place value numbers*

Mr. Chipasula: *place value of numbers (while correcting the second bullet), so since we are talking of decimals and place value of decimal numbers, necessary now with this knowledge, how can we teach multiplication for the first time, so in your discussions please include rules which we follow when multiplying decimal numbers, use the following example (writing the example on the board, 6.9 * 0.005), six point nine times zero point zero five, discuss steps of procedure to be followed to come up with a correct answer so those procedure will give you some general rules, lets have five minutes*

Ss: *students discussing in their groups*

Mr. Chipasula: *(moving around observing what the students were discussing, asking students where they are, giving some comments, asking each group are you through now) what about here are you through now. (After a while) one more minute (after a while) 30 seconds now, where are you now? Are you through here, now its time up, lets discuss your results, so I think for example given we have now the rules, the procedures to be followed when multiplying decimal numbers, so lets start with which group, hands up, we will only need two groups, so lets start with this group, come and write down the procedure (giving the chalk to the presenter), the rules first, just the rules, … the particulars in the examples (student writing on the board), its time up for discussions, so lets observe what … (first presenter writing), this group you are making noise (mathematics teacher educators stands at the back, class quite), thank you, so those are the rules according to this group, they are saying forget about the decimals, just regard them as whole numbers, count the decimal places in the multiplicand and in the multiplier after finding the answer, add the decimal places from both sides, that is one plus two is equal to three, count from right to left to find the expected answer according to the number of the sum of decimal places, that is three (reading the rules written by the first group), so they are using one, two, and three (mathematics teacher educators speaks as he goes to the front), so I said general, so these are (circling the one plus two equals three and last point that's is three) not general they are from the example given now do you think to the rest of the groups now, do you think this procedure a chap can manage to get the correct answer with those pre requisite knowledge, is the procedure clear, is the procedure here clear (smiling)*

Ss: *noisy background*

Mr. Chipasula: *it's clear*

SG: *it's clear*

Mr. Chipasula: *what are the … madam*

S3: *it's clear but to the learners it's complicated, it's clear but to the learners it's complicated*

Mr. Chipasula:*:* *learners it's complicated, what type of procedure which is clear, so which group thinks its procedure is clear, yah, let's listen to this group, ah sit down madam, just read*
SG2: *ignore the decimal point and ignore them*
Mr. Chipasula: *(writing), ummhu*
SG2: *then multiply the quotient, iih, the multiplicand and the multiplier*
Mr. Chipasula: *(writing) ummhu*
SG2: *add the two quotients to get the answer*
Mr. Chipasula: *(writing), add the*
SG2: *add the two ah (product from the background), products*
Mr. Chipasula: *(writing), add the two products and then*
SG2: *then count the decimal places*
Mr. Chipasula: *(writing), count the decimal places*
SG2: *count from the …*
Mr. Chipasula: *count from*
SG2: *from the right to the left*
Mr. Chipasula: *(writing), from the right to the left, thank you*
Ss: *laughing*
Mr. Chipasula: *is this one better than this one*
Ss: *it's the same*
Mr. Chipasula: *what about that group, because you are second to raise up your hand … listen, you will … your procedure*
SG3: *yah we all first thought of multiplying the numbers*
Mr. Chipasula: *(writing)*
SG3: *yah, secondly count the number, number after decimal point, the digits after decimal point on multiplicand and multiplier*
Mr. Chipasula: *(writing), then*
SG3: *then after counting the total number of decimals points, decimal numbers, count the numbers count the numbers one by one from left to right so that you find the decimal … from right to left*
Mr. Chipasula: *(writing), from right to left*
SG3: *yah*
Mr. Chipasula: *(writing), thank you, any group which feels their procedure is totally different from these three*
SG4: *yah this group*
Mr. Chipasula: *totally different*
SG4: *yah*
Mr. Chipasula: *ummhu lets listen*
SG4: *first we have said change the decimal numbers to whole numbers*
Mr. Chipasula: *(writing), change decimal numbers to whole numbers then*
SG4: *then multiply*
Mr. Chipasula: *after multiplying*
SG4: *then count the decimal that is from right to left, then put a decimal point*
Mr. Chipasula: *so I think it's almost the same as this one, only that you are saying you change decimals to whole numbers which one is better way, changing*

decimals to whole numbers or forgetting the decimals, forget about the decimals decimal points

SG: *change*

Mr. Chipasula: *changing, so lets change these to whole numbers how can you change this one to whole number (referring to the example given),*

Ss: *noisy*

Mr. Chipasula: *one at a time you multiply by (pointing to a student),*

S4: *by ten*

Mr. Chipasula: *you multiply by ten here,*

S4: *by a hundred*

Mr. Chipasula: *you multiply by a hundred, , so if you multiply lets follow their argument first, we get sixty nine, and we get five (writing), but now here its also a problem, we are talking of multiplication (writing), so the procedure to get five I think its partly the same procedure we want here , how do you get five as a whole number, when you multiply zero point zero five by a hundred so to get that five it means you would have some of these procedures (laughing)*

Ss: *laughing*

Mr. Chipasula: *(rubbing), so I think its just better to tell our learners that first of all we ignore the points, we take these as whole numbers, so this step will give you sixty nine times five (writing) (He tells the first step), so what should be the second step, multiply just like this one, they say forget the decimal places, then multiply the numbers, so we are treating these as whole numbers and in the prerequisite knowledge we mentioned multiplication of whole numbers so they know how to multiply,, so if we multiply sixty nine by five what do we get, you multiplied in your groups*

S5: *three hundred and forty five*

Mr. Chipasula: *three four five*

S5: *yes*

Mr. Chipasula: *so this step is as three hundred and! Forty five is this the correct answer*

Mr. Chipasula & Ss: *no*

Mr. Chipasula: *we are not yet through, so what is the next step, according to this they say add the two products, is this possible*

Ss: *laughing*

Mr. Chipasula: *what are what is the product, product is the answer*

Ss: *yes*

Mr. Chipasula: *so this is the answer (referring to three four five), so is this the answer*

Ss: *no*

Mr. Chipasula: *no, so I think we can take may be here, (referring to another given procedures), they are saying count the number of decimal places in multiplicand and multiplier so we just need to count the number of digits after point, so in the first number which you called what multiplicand, how many decimal places, how many digits after the point*

Ss: *one*

Mr. Chipasula: *one and in the second number, which you are calling it multiplier how many digits after a point ((writing) the number of decimal places in the original),*

so I have used original because we have removed the decimal point now we are referring to the given numbers so if we add the number of decimal places, this one is giving us three, so what do we do with this three, now we go back to the answer so as you are saying like here you are saying count from right to the left, so start counting from the last digit which is right going this way, left we count three digits (writing count number of digits in the answer from right to left), so you count number of digits in the answer from right to left in order to get position of decimal point, so since our answer is after multiplying is (writing three four five), three four five, we count three digits because this step gives us three, step three gives us three, so we count one, two, three so we put a point here, since we don't have any number what do we do

Ss: *put a zero*

Mr. Chipasula: *we put a zero, so that how we … multiplication of decimals, if a learner is able to follow these steps, these rules, these are just some of the rules, then that learner can get correct answer, questions, … or comments on the general rules, ask the class because you are in the same group, what's called a comment , no question*

S6: *sir*

Mr. Chipasula: *ummhu (pointing at him)*

S6: *we have to multiply by ten to six point nine and by hundred to zero point zero five*

Mr. Chipasula: *(writing), ummhu*

S6: *so I don't know when or how is this method applicable*

Mr. Chipasula: *this method of multiplying by ten*

S6: *or by the*

Mr. Chipasula: *or by hundred*

S6: *or by the denominator of the number*

Mr. Chipasula: *denominator, do we have denominators here,*

S6: *as ten or one hundred the number will be decimal*

Mr. Chipasula: *so that's, lets convert these (referring to 6.9 and 0.05), to fractions first so that we have sixty nine over ten times five over! Hundred, so since our learner… Kaye ma fractions, they multiply the numerators, they multiply the denominators so they get three four five, over what is ten times one hundred*

Ss: *one thousand*

Mr. Chipasula: *one thou, then you convert these back to!*

Ss: *decimals*

Mr. Chipasula: *decimals (writing 0.345),*

S6: *so when is that applicable to learner?*

Mr. Chipasula: *when or how*

S6: *when and how*

Mr. Chipasula & Ss: *laughing*

Mr. Chipasula: *the how we have seen that the answer here is the same as this one, so I think you can see that it is applicable, anyway you know that this number sixty nine over ten (circling it), is the same as this one (referring to 6.9), so if this is correct and this is correct, then since this is a correct procedure you multiply these fractions, then you automatically get the correct answer, but which one is better? Converting to fractions, multiply and convert back to decimals, or just forget about the decimal places, you multiply, you count the total number of decimal places in the given factors*

S7: *why are we forgetting these decimal places because they are part of the numbers?*
Mr. Chipasula: *why are we forgetting these (pointing to the points), because they are part of a number, that's another question*
S8: *and seconded by another question*
Mr. Chipasula: *no, wait, one question at a time (pointing to another student),*
S9: *I think it's a way of the answer*
Mr. Chipasula: *it's a way to*
S9: *to the answer*
Mr. Chipasula: *the way to the answer*
Mr. Chipasula:*& Ss: laughing*
Mr. Chipasula: *it's the way to the answer (pointing another one)*
S10: *I think it's for the learners to multiply the numbers, so we …*
Mr. Chipasula: *because we know that our learners by this time they know multiplication of whole numbers so what they find this easier for them, that's what he is saying …*
S11:
Mr. Chipasula & Ss: *laughing*
Mr. Chipasula: *so it's the way, so this one is used to this one so madam,*
S12:
Mr. Chipasula: *you are making noise, it is*
S12: *the simplest method*
Mr. Chipasula: *the simplest method*
Ss: *how*
Mr. Chipasula: *you see to her it's the simplest method*
Ss: *how*
Mr. Chipasula: *do we have the simpler method than this one, on the same question*
S13: *ah no, is it possible to use another method like real objects to multiply this*
Mr. Chipasula:*& Ss: laughing*
Mr. Chipasula: *is it possible to use real objects like in multiplying this, that's his question, I think it will be complicated so learners instead of understanding you will just confuse them, madam*
S14: *on the procedure*
Mr. Chipasula: *if we multiply six point nine by*
S14: *zero point two five*
Mr. Chipasula: *zero point two five, is the procedure the same that's her question, what you think madam (another one),*
S15:
Mr. Chipasula: *class is the procedure the same or we have the special procedure*
Ss: *the same*
Mr. Chipasula: *is the same, so this procedure or these general rules apply for any multiplication, involving decimals whether you have one as a decimal number, the other one a whole number you still use these rules, so in this case six point nine times ten, we forget about the decimal point, so it is sixty nine times! Ten whish you know its*

what, six nine zero, you are disturbing her (referring to the other student), then what do we do

Ss: *count*

Mr. Chipasula: *we count the total number of decimal places or the total number of digits after a point so we have only one in the first number, in the second number*

Mr. Chipasula:*& Ss: zero*

Mr. Chipasula: *so the total number of decimal places*

Ss: *one*

Mr. Chipasula: *so from here we just count one digit, so we are here, is your question answered madam? Who was asking, yah?*

S14: *yes*

Mr. Chipasula: *are you convinced*

S14:

Mr. Chipasula: *we are saying you use the same procedure, so here we were discussing this one, where one is a whole number, and the other one is a decimal number, so you forget about this one so you multiply sixty nine and*

Mr. Chipasula & Ss: *two five*

Mr. Chipasula: *when you multiply you count how many number of decimal places, the same procedure madam, last question (pointing to a student)*

S16: *using the same*

Mr. Chipasula: *what can be the best one?*

S16

Mr. Chipasula: *you just ignore it temporary*

S16: *so if we say forget we are …*

Mr. Chipasula: *ok, this one is saying its better to say, lets say just ignore it temporary not forget, because if we forget, he will forget forever*

Mr. Chipasula:*& Ss: laughing*

Mr. Chipasula: *but when you forget and remember to add, that's ok*

Ss: *laughing*

Mr. Chipasula: *the only*

Ss: *still laughing*

Mr. Chipasula: *bad thing is only when they forget here, they also forget here*

S17: *its mathematics and not …*

Mr. Chipasula: *its mathematics*

Ss: *ah*

Mr. Chipasula: *provided you tell your learners what you mean by saying you forget or ignore what, temporarily so I think since you multiply numbers decimal numbers from primary school there is no need for you to multiply but for the sake of this lesson, just copy this number somewhere (167.4 * 2, 0001) one sixty seven point four times two point zero, zero, zero one. You write it somewhere and solve it before tomorrow, tomorrow we are meeting at ten I think (the bell rings), yah before ten o'clock tomorrow solve out this one*

S18: *it's a big one*

Mr. Chipasula: *it's a big one, so each one should solve on his or her own, not saying we were waiting for group work, no, no group work here. So since its four o'clock, we can call it a day so we meet tomorrow.*

CHIPASULA – LESSON 5

Mr. Chipasula: *yesterday I gave you one question, have you tried it*

Ss: *yes*

Mr. Chipasula: *(writing decimals) and the question was on*

Ss: *multiplication*

Mr. Chipasula: *(referring to students notes, then moves around the class checking if everybody has written the assignment), its ok I have checked, most of multiplied except this one, where were you, so lets just go through the process of multiplying decimal numbers, madam, come, you take your note book, whatever you so that …, but can leave or just copy*

S1: *(copying the problem on the board),*

Mr. Chipasula: *ok so for the solution solve it (while taking the note book away from her) now*

S1: *(solving on the board)*

Mr. Chipasula: *do you belong to this classroom (referring to the late comers)*

Ss: *no*

Mr. Chipasula: *you are from which classroom*

Ss: *class C7*

Mr. Chipasula: *be, yes go back to C7, you are not invited so those who are coming from C7 please go back to your classes, yes am saying would you please go back to your classroom, now we have seen what madam has done here, lets comment to the solution on the chalk board, is it the way you like or learners to multiply whole numbers, you are late sir, (referring to late comers), where are you coming from, you are from this classroom*

Ss: *yes*

Mr. Chipasula: *does this one belong to this classroom (asking confirmation from the class)*

Ss: *yes*

Mr. Chipasula: *let's comment on the solution, is this the way we would like our learners to multiply, ummhu*

S2: *I would write zeros …. Should have just written three zeros*

Mr. Chipasula: *writing of zeros here, this one thinks it's a waste of time, that's what he is thinking, are the zeros important, yes*

S3: *I think they are important*

Mr. Chipasula: *why*

S3: *because that the place of, they are keeping the all the decimal part*

Mr. Chipasula:*: on the decimal part, so that one is saying we need to keep the zeros because they keep the place of decimal part, what about the rest, ummhu madam*

S4: *I think the zeros are important because for him he is saying they are not important because he is a, but for the learners I think if we can leave them learners can be carried away*

Mr. Chipasula: *if we leave these (circling the zeros), what will happen*

S5:

Mr. Chipasula: *this …*

S5: *yes*

Mr. Chipasula: *so some are saying its important because they will keep position of these number eight, why do we have gaps here, yah, for example when we are multiplying with one we have four here, this one have zero here, why this gap*
S6: *they are … the place value of each number of which each … stands*
Mr. Chipasula: *so we are using the … in the multiplier, so if we are multiplying by one, one is the last digit, have to write four here, when you are multiplying with zero, so I think when you are multiplying by two make sure that the first digit is directly below two, so does this … although somewhere looks like …. Because have this line, then this one, this one, so one can think eight belongs to the place after zero so the way we arrange these numbers is very important to our learners, now after at least we have … ummhu*
S7:
Mr. Chipasula: *there is no*
S7: *no need to put points there*
Mr. Chipasula: *here, what do you say class do we need to put points here?*
Ss: *no*
Mr. Chipasula: *no, suppose we remove them, how will we know that the point is here*
Ss: *we go back to that one*
Mr. Chipasula: *we go back to this one*
Ss: *yes*
Mr. Chipasula: *so it doesn't matter whether we have these points or not provided we remember where to put the point in the answer remember yesterday, we were saying suppose we tell our learners to forget, forget about the decimal points and they forget forever*
Ss: *laughing*
Mr. Chipasula: *they would get wrong answers, so it's the way you train your learners, if they have the points when multiplying they just temporary ignore the points, so the concept, but you feel these points are confusing our learners we would tell them to omit the points for this step, now lets move on to division (rubbing and writing division of decimals), division of decimals, first of all lets discuss pre requisite knowledge which learners should have before introduced to division of decimals numbers, or decimals, so you think of concepts which are very important or which are used when dividing decimals, so discuss in your groups and at least come up with two points, or two concepts which you think are very important to the division of decimals*
Ss: *students discussing while the lecture moves around to check what students are discussing in their groups, lecture discussing with students as well*
Mr. Chipasula: *since each group has at least two, so lets here from the groups now, each group you can give us one concept, since some of them are just the same, so may you can empty what your friends have, lets here from this group, lets start with this group, who is representing the group*
SG1: *the learners should know the division of whole numbers*
Mr. Chipasula: *so this group has division of whole numbers (writing division of whole numbers), what about this group*
SG2: *knowledge of subtraction of basic facts*
Mr. Chipasula: *(writing), subtraction of basic facts, this group*

SG3: *addition of basic facts*
Mr. Chipasula: *(writing), what about that group*
SG4: *have knowledge of changing fractions to whole numbers*
Mr. Chipasula: *changing fractions to*
SG4: *whole numbers*
Mr. Chipasula: *(writing), do you have something to add*
SG5: *basic facts of division*
Mr. Chipasula: *(writing), basic facts of division, what about that group, any addition anything to add*
SG6: *yah, we have knowledge of, they need to have knowledge of … subtraction*
Mr. Chipasula: *basic subtraction*
SG6: *repeated subtraction*
Mr. Chipasula: *repeated subtraction*
SG6: *yes*
Mr. Chipasula: *(writing), anything to add on the list*
SG1: *place value of numbers*
Mr. Chipasula: *place value of numbers (writing) ummhu*
SG6: *knowledge of multiplication of decimals*
Mr. Chipasula: *multiplication of decimals (writing), anymore ok so we have eight (reading through his points written on the board), on subtraction, we have subtraction of basic facts, repeated subtraction, which one should we take*
Ss: *repeated subtraction*
Mr. Chipasula: *repeated*
Ss: *yes*
Mr. Chipasula: *if they can subtract basic facts, then they can be able to do this (referring to repeated subtraction), so as it is, lets leave them because we will check after discussing how to divide decimals, so we will check which ones are more important, you revise before teaching of division of decimals, (writing an example on the board), here is an example of division of decimals, eight point one nine divide by zero point nine, use this example to come up with general rules or major steps to be used when teaching division, division of decimals, use this example so as you are solving it generate some rules or point out some main steps what you emphasize when you are teaching division of decimal, so choose one member to write for the group, who is writing here, this one, so the rest would …*
Ss: *(discussing while the mathematics teacher educators moves around checking what students are discussing)*
Mr. Chipasula: *its time up now, so lets discuss together on whatever you have agreed on multiplication, on division of decimal numbers, so lets have three groups, write their presentations on the board, so instead of just reading write the steps, this group and this group, who is going to write here (giving the piece of chalk to the presenters),*
Ss: *student's representatives writing on the chalk board*
Mr. Chipasula: *please leave those that are writing alone, otherwise you will disturb them, thank you, so we have these three solutions and procedures I know we have just called three groups, there are three more groups, you have chance to add what you have, lets discuss this one first, I think you have read, you have gone through*

their process, the same procedure, remove the decimal points by multiplying all decimal numbers by one hundred, divide the whole numbers by using long division (reading from the chalk board), that's now the whole steps

SG1: *yah*

Mr. Chipasula: *so the procedure they have only two removing by multiplying by a hundred and divide whole numbers by using long division, before we ask for clarification, lets see the second group, move the decimal point to make the divisor to be whole numbers, move the decimal point of the dividend by the same number of decimal places as in the divisor, then divide the numbers (reading points of the second group), have three, while this one say (reading the procedure for the third group), change the divisor to a whole number by multiplying the divisor by ten, again multiply the dividend by the same ten, arrange and divide the, arrange and change the form, then divide, so they have that, they are dividing.*

MR OTANI– LESSON 4

Mr. Otani: *0.248) then times, one hundred what is the answer*
Ss: *twenty four point eight*
Mr. Otani: *what*
Ss: *twenty four point eight*
Mr. Otani: *ok, twenty four point eh, two four eight zero zero, then two decimal places (24800.), one two, three which will give us twenty four point!*
Ss: *eight*
Mr. Otani: *now how many decimal places as a decimal point shifted from here going to that side?*
Ss: *two*
Mr. Otani: *two, but we have multiplied by ten here raised to the power what!*
Ss: *two*
Mr. Otani: *(writes ten squared in place of 100), raised to the power two, which is hundred, now how can you conclude ah the process, how can you conclude this strategy, (silence), yes (pointing to a student)*
S1: *we can say ah as the number of decimals increases the powers of tens also increases*
Mr. Otani: *laughing, ok, ok, yes*
S2: *we can say that eh decimal number multiplied by ten, then eh multiply by eh, the number to the base ten raised, I can say multiply by ten raised to a certain number, the product is or the decimal point shifted, eh the places equal to the number raised, laughing*
Mr. Otani & Ss: *laughing*
Mr. Otani: *tatifotokozerani mchichewa*
S2: *ah in Chichewa that's when I will be totally lost*
Mr. Otani: *ok*
Ss: *laughing*
Mr. Otani: *nanga mChitumbuka*
S2: *yah in Chitumbuka*
Ss: *laughing*
S2: *no problem, number yonse titayichita multiply na ten, ten tampanga raise ku nambala inyake, and sala ikuwa, ikuwa number uja tachita ah ujeni ummhu ya decimal and decimal point wakusitha kuruta ku manyiro uko*
Ss: *laughing*
S2: *depending on number iyo tapanga raise*
Mr. Otani: *ok*
Mr. Otani & Ss: *laughing*
Mr. Otani: *so afotokoza awo chimvekere eti*
Ss: *eya*
Mr. Otani: *kwamene timanva Chitumbuka tamva chimvekereni*
Ss: *eeh*
Mr. Otani: *koma kwa a mene simukumva ndiye kayatu*
Ss: *laughing*
S2: *excuse me sir*
Mr. Otani: *yes*

S2: *let me just explain that*
Mr. Otani: *alright, alright*
Ss: *still laughing*
S2: *(going to the front to explain on the board), I should explain that here any number which is here having a decimal point and this number has been multiplied by ten and this ten has been raised to a certain number the product here will be this number and here to know the ah, ah where decimal point will be we just ah note the number here that ten has been raised to, we just see that here we are having two which means that here ten has been raised to the power two, then here we just ah shift here going to the right eh two steps any number even if it is zero point four two six one times ten to the power three, it means that we have to shift from here to this side, so the product will be four two six point one just in guided by this number*
Mr. Otani: *alright, thank you very much, thank you*
Ss: *laughing*
Mr. Otani: *is it clear*
Ss: *noisy background, laughing*
Mr. Otani: *alright, so to multiply a decimal number by ten, ten raised to n or power ten, to multiply a decimal number by ten raised to the power n (dictating notes), then open bracket where n is a natural number, where n is a natural number, close bracket, move the decimal point, move the decimal point to the right, to the right n times, n times, n times, that is to say you move ah the decimal point according to the number that this ten has been raise, if ten is raised to the power four, you move how many places!*
Ss: *four*
Mr. Otani: *raised to the power two how many places!*
Ss: *two*
Mr. Otani: *raised to the power five how many places!*
Ss: *five*
Mr. Otani: *five, ok, eh mafunso alipo*
SG: *eeh*
Mr. Otani: *eeh funsani, eh (pointing to the student)*
S2: *so those problems, is there no need of modeling then, because I have seen, since you have introduced no modeling has taken place*
Mr. Otani: *ah, ok, its, its ah difficult for us to model this ah, and pupils can not understand well modeling this problem, so that's why just go direct to multiplication, it's like multiplication of! Whole numbers*
S3: *sir*
Mr. Otani: *yes*
S3: *a question from learners to say in multiplication, like in subtraction we were using ah number place values, while this multiplication there are no place values, so, so why is it so about it in multiply, oh sorry, in subtraction we were writing the place values where we placed the numbers eti, eh, but now in multiplication we are not using those place values, why*
Mr. Otani: *why*
S3: *yes*
Mr. Otani: *ok, at first I said multiply the numbers as if they are what*

Ss: *whole numbers*
Mr. Otani: *whole numbers, so even if you, you don't write the place value, no problem you are going to multiply these numbers as whole numbers, as if whole numbers, after that that's when you consider the number of decimal places, then we shift decimal place ah from the decimal point from the right hand side to the left hand side according to the number of decimals, so even if you don't write ah the place value chart, ah no problem, aha yes*
S4: *my question is ah you said that on … thing as you said in … if I remember well, you told us that multiplication of whole numbers ….*
Mr. Otani: *ah timanena kuti in multiplication of whole numbers …*
S4: *if I remember well we had to use …*
Mr. Otani: *ok*
S4: *number of groups and … there is a multiplier and a multiplicand*
Mr. Otani: *yes*
S4: *where by … or we were breaking this one to and in each group they had these … I have forgotten the other one, why cant you … those methods … here*
Mr. Otani: *alright, let us look at this one, the ah four times two, four times two ah or I should say fourteen times three, I was saying that lets take this fourteen, this fourteen is a multiplicand, while three is what*
Ss: *a multiplier*
Mr. Otani: *now what is the meaning of a multiplicand, is this … yes*
S5: *it's a number of groups*
Mr. Otani: *it's a number of!*
Ss: *groups*
Mr. Otani: *so how many groups will, it will have how many groups*
Ss: *fourteen*
Mr. Otani: *fourteen, but if each group, but in each group we should have how many items*
Ss: *three*
Mr. Otani: *three eti, ok, now the very same problem (writes 1.4 * 0.3), ok how many groups here (pointing to 1.4)*
Ss: *one group*
Mr. Otani:& *Ss: laughing*
Mr. Otani: *ok one point*
Ss: *four*
Mr. Otani: *ok is it possible for you to model this one*
Ss: *it will be possible but with difficulties (noisy background)*
Mr. Otani: *what*
S6: *we must change*
Mr. Otani: *we must change what*
S6: *the numbers must be whole numbers*
Mr. Otani: *so after that*
S6:
Mr. Otani:& *Ss: ahh, laughing (noisy background)*
Mr. Otani: *anawo sangakamve that's why you just decide to do as ordinary what multiplication, (silence), yes*

S2: *my question is just a supplement to what my friend has already asked*
Mr. Otani: *yes*
S2: *ah why*
Ss: *laughing*
S2: *sorry, the question is ah we are doing those things, so that we apply them when we are going for …I don't know if the primary curriculum also incorporated the number of … or may be it has just been done so that we have wider knowledge*
Mr. Otani: *I said earlier own that your curriculum is just academic and*
Ss: *methodology*
Mr. Otani: *the academic part is for you as a student here at Kasungu what*
Ss: *TTC*
Mr. Otani: *methodology, the method you are going to use when teaching pupils, sichoncho*
Ss: *yes*
Mr. Otani: *ndiye zonsenzo ndizoti zikuyendera limodzi mmomwemu, yes*
S2: *yah in this topic we have seen that you have said that no modeling is being encouraged there*
Mr. Otani: *sure*
S2: *and previous topics modeling was highly encouraged, now you are saying that you are doing that to avoid confusing the pupils*
Mr. Otani: *yes*
S2: *now being a teacher I have gone to a certain primary school and there I have accessed my class and I have seen that if I do modeling I will confuse the pupils and I have just decided to leave modeling and just concentrate on my (students laughing), is that encouraged or I should do modeling as a must*
Mr. Otani: *yah ah, ah it's a question of must but not really a must, as a teacher you can see the situation, here I can model here I can not what*
Ss: *model*
Mr. Otani: *model, you should be flexible, tikangonena kuti modeling sindiye kuti everyday modeling, modeling, modeling, modeling, simungamalinzenso ndi curriculum yomwe, we do modeling when we are teaching the meaning of what is happening eti, for pupils to understand what is happening, aha, its when we model, but after that you teach them other, I should say abstract what! Stage where by you just use only numbers, here its not a question of must, kuti paliponse you have to model, model, model but modeling is encouraged, why for pupils to learn through ah all senses or through most of what! Senses, sense of seeing, sense of touch sense of hearing and sense of aha*
Ss: *smelling*
Mr. Otani: *smelling, sense of smell?*
Ss: *laughing*
Mr. Otani: *mwina ngati angathe, kumasamu zikhoza kutheka*
Mr. Otani & Ss: *laughing*
Mr. Otani: *unless it is science, science but mathematics smelling (all laughing), ok mafunso ena alipo*
S7: *I have a question*
Mr. Otani: *yes*

S7: *on that problem two point four nine two times five point one ah one, when the teacher was solving there, ah he did not remove ah those points, is it good or may be we should remove them when we are multiplying and come back to the points latter,*
Mr. Otani: *ah what do you think enanu, akuti when we are solving this problem, izizi sanachotse, is it good or is bad (noisy discussion), yes*
S8: *I think its bad because earlier own you have said when multiplying these numbers, with decimals we have to we have to multiply them as decimals*
Mr. Otani: *ok*
Ss: *as whole numbers*
S8: *yes as whole numbers, so as in the first place we can see that the problem has already written two point four nine two times five point one two then, when writing the way it has been written there we should remove these decimals*
Mr. Otani: *yes*
S9: *I think there we must … has it … next …. Down in our solution, we are going to ignore the decimal point, why ignoring, so that may be not, … confuse learners, at the very end we are going to leave our answer as it has been written … so that pupils can see not just ignoring for good, that is*
Mr. Otani: *yes*
S10: *I think we just ignore … we have to count the number of digits to replace the decimal point, they can see from that problem and not … somewhere else, so I think that its normal but after … decimal point*
Mr. Otani: *eeh, here*
S10: *yes*
Mr. Otani: *you ignore the decimal point here up to the end, but here too them, why, because when counting the number of decimals you use ah, you use the very same numbers, yes*
S11: *why … taking the point that is … since they know that when writing the whole number, the fraction, they have to … them so that the denominator, so the whole numbers should be that side and the fraction be that side, so I think we should ignore those decimal points, later own that when we come back and say ok lets put back the decimal places*
Mr. Otani: *laughing (noisy background), ok,*
Ss:
Mr. Otani: *understand how many decimal places ah so if they don't know how many decimal places are here they should be able to count, and where its here poyambirira, kapena mufuna kunena kuti tikalemba izi, after this one, ndipamene tizibwera apa, that's when we can ignore the decimal points*
Ss: *yes*
Mr. Otani: *so that when it comes to anumber of decimal places they should count from here*
Ss: *noisy*
Mr. Otani: *but its good here to indicate, its good here to indicate, but when multiplying that's when you ignore the decimal points after that then you place the decimal point (pause), alright now let us come to division (rubbing the board, writing division of decimals), division of decimals, division of decimals (writing 51.45 / 4.9), ok*

lets say we have fifty one point four five divide by four point nine, … solve the problem, ah is it difficult

Ss: *no*

S12: *(student going to front, receives chalk from the mathematics teacher educators)for the first time we have to remove our decimal points, here to remove the decimal point we have to multiply (writing 51.45), here we have two digits, it means we are going to multiply by a hundred and we do the same with this (writing 51.45 * 100 / 4.9 * 100) so here we get five one four five by four nine, we are remaining with a zero, we put a zero (writing 5145/490), now, we have the long division, now we are dealing with these numbers as whole numbers, now we can divide four hundred and ninety into five hundred and fourteen*

Ss: *one*

S12: *one (writes on top of four), now, one times zero, zero (writes), one times nine, nine (writes), one times four (writes four), then we subtract four minus zero*

Ss: *zero*

S12: *zero (writes), here we take one from five and here have eleven, eleven minus nine*

Ss: *two*

S12: *it will be two then we drop five, now four hundred and ninety into two hundred and forty five*

Ss: *zero*

S12: *so here we write zero then point, now we have come to our … now we have introduced a decimal point, just because it fails, then here we put what, zero then four hundred and ninety into two thousand four hundred and fifty, its how many times*

Ss: *five*

S12: *five, so we multiply five times zero, zero, five times nine*

Ss: *forty five*

S12: *forty five (writes five only), five times four twenty, plus four twenty four, so its we subtract here the answer is zero, now our answer is ten point five (writes)*

Mr. Otani: *thank you, is he right*

Ss: *no some say yes*

Mr. Otani: *who said no, why not?*

S13: *first of all we have to consider the divisor, so can ask this question to the learners to say, how can you make that four point nine a whole number, so they will normally say, its we have to multiply that number by ten to make that four point nine a whole number and do … that will be … point nine, and the same ten should be multiplied to the dividend*

Mr. Otani: *ok*

S13: *yes, its when we come to division*

Ss: *noisy*

S13: *but with this explanation we have …*

Mr. Otani: *ok ok any argument*

Ss: *noisy*

S14: *the answer is correct but the solving, when we are dividing the only target is to make the divisor a whole number, to make that a whole number we have to multiply by ten, at the very same time we multiply by that one*

S15: *it doesn't matter which one you have used so long as we have the right answer*
Mr. Otani & Ss: *laughing*
Mr. Otani: *yes*
S2: *we are, we are after the answer but we are also after teaching the learners the simplest way*
Mr. Otani: *ok*
S2: *yah so there by considering the divisor there , it means we are giving a clue to them that always, they will basing on the divisor, and that divisor should be a whole number before it can start going into the dividend*
Mr. Otani: *ok*
S2: *so it is good considering the divisor rather than the dividend*
Mr. Otani: *here, Mr. … sir, here what you should do is, first make this one as a whole number (pointing to four point nine), unlike to make this one as a whole number you can see that after taking this one as a whole number then the divisor this divisor, was … for a pupil ah to*
Ss: *solve*
Mr. Otani: *solve, coming up to four hundred and*
Ss: *ninety*
Mr. Otani: *ninety and that was difficult for some one to... so what you should do first is to make the divisor the whole number by counting the number of decimal places, so here the divisor has how many decimal places!*
Ss: *one*
Mr. Otani: *one, so you should multiply the divisor by*
Ss: *ten*
Mr. Otani: *ten and the dividend by*
Ss: *ten*
Mr. Otani: *ten, so when you multiply this one by ten, it will be forty nine and when you multiply this one by! Ten it should be five hundred and fourteen points!*
Ss: *five*
Mr. Otani: *five after that that's when you can divide, komabe simunalakwe, its all one, iyiyo yachitika apayi, koma ndiyofunika someone who is mature here (pointing his head), alright no to summarize everything, to summarize everything to divide the decimal numbers, to divide the decimal numbers first point, move the decimal point, move the decimal point in the divisor so it is a whole number, so it is a whole number, second point, move the decimal point in the dividend the same number of places, the same number of places as in the divisor, as in the divisor to the right, to the right, third point place the decimal point, place the decimal point in the quotient, in the quotient directly above, directly above the new decimal point in the dividend then the last point is then divide just as a whole number, divide just as a whole number, so what is the meaning of this one, it was with this sum, what you should do is first is to make, you shift the decimal point here up to here, so after that its when you divide five hundred and fourteen point five then divide by forty nine, so here its one, then forty nine, ok, its what two, drop down four, then forty nine into twenty four*
Ss: *zero*
Mr. Otani: *zero (writes), then you place this decimal point direct eti,*
Ss: *yah*

Mr. Otani: *so it will be here then you drop down what*
Ss: *five*
Mr. Otani: *five (write), so forty nine into this one*
Ss: *five*
Mr. Otani: *five which is two forty five, zero, it is as simple as eating nsima, mafunso alipo, palibe mafunso, ok ah walero tinene kuti taonera momwemu mwambi wa gulugufe, next lesson we are going to start percentage, so this is the end of decimal fractions, thank you very much*
Ss: *thank you.*

MR. OTANI LESSON 1

Mr. Otani:*: Yesterday we were discussing how you can convert common fractions into decimal fractions and decimal fractions into common fractions. Lets say we have a fraction like half, how can you convert that fraction into a decimal fraction? (Pause), yes*

S1: *By dividing the numerator by the denominator*

Mr. Otani: *By dividing the numerator by the!*

Ss: *denominator*

Mr. Otani: *divide the numerator by the denominator, so its like here, two into one!*

Ss: *Zero*

Mr. Otani: *Zero, (writing on the chalk board), aha, after writing zero you put what!*

Ss: *decimal point*

Mr. Otani: *(writing on the chalk board the decimal point), right, aha, after that!*

Ss: *add a zero*

Mr. Otani: *so here we write zero*

Ss:

Mr. Otani: *then two into ten!*

Ss: *five*

Mr. Otani: *(writing on the board five), therefore half is equivalent to!*

Ss: *zero point five*

Mr. Otani: *ok, what about one over one thousand, (silence), one over one thousand, let us convert that one into decimal places, (Silence), yes*

S2: *we are going to ah to, since it's a … fraction, so we are going to say one thousand into one, is zero*

Mr. Otani: *ok, zero point (writing on the chalk board)*

S2: *then we add another zero*

Mr. Otani: *ok, we write zero here, then we are going to divide by!*

Ss: *one thousand*

Mr. Otani: *so one thousand into ten?*

Ss: *zero*

Mr. Otani: *aha, zero, (writing on the chalk board zero) aha!*

Ss: *we add another zero*

Mr. Otani: *we add another zero (writing on the chalk board zero 10) to make what!*

Ss: *one hundred*

Mr. Otani: *one thousand into one hundred!*

Ss: *zero*

Mr. Otani: *another zero (writing on the chalk board another zero)*

Ss: *then we add another zero*

Mr. Otani: *add another zero (writing on the chalk board zero to 100)*

S2: *to make a thousand*

Mr. Otani: *ok, so one thousand into one thousand*

Ss: *one*

Mr. Otani: *right, now what if you are given a decimal fraction like zero point two five, you want to take that one into ah, common fraction, how can you change that one into common fraction (silence) yes (pointing to a student)*

S3: *by first of all writing bar*

Mr. Otani: *we are going to write bar, ah (writes bar under 0.25)*
S3: *yes*
Mr. Otani: *aha*
S3: *then we put one as a, as a denominator*
Mr. Otani: *you put what?*
S3: *one*
Mr. Otani: *where?*
S3: *under*
Ss: *under, under, under the point*
Mr. Otani: *under the point*
Ss: *yes*
Mr. Otani: *write one (writing one under the decimal point) aha,*
S3: *from there start multiplying*
Mr. Otani: *start multiplying*
Ss: *no*
Mr. Otani: *(laughing), multiplying by what*
Ss: *everybody speaks (not clear)*
Mr. Otani: *yes, (pointing to the student)*
S2: *since our figure has got two decimal places that means we are going to multiply the number which has two zeros, in which case, ah our sum that means we are going to multiply by a hundred*
Mr. Otani: *ok*
S2: *a hundred*
Mr. Otani: *ok, since our number, this one has got how many decimal places!*
Ss: *two*
Mr. Otani: *so, ah if you want to change this one to common fraction what you should do is to multiply the numerator by hundred and the denominator by!*
Ss: *hundred*
Mr. Otani: *hundred, is it?*
Ss: *yes*
Mr. Otani: *if you multiply this one by a hundred, it will be two five zero zero, how many decimal places!*
Ss: *two*
Mr. Otani: *so the decimal point is here (i.e. 2500.) then you shift this decimal point to the left hand side so its one two (25.00) then you multiply this one down here by!*
Ss: *one hundred*
Mr. Otani: *by a hundred, so over hundred, then our answer is twenty five over!*
Ss: *hundred*
Mr. Otani: *hundred which is equivalent to*
Ss: *one quarter*
Mr. Otani: *equivalent to one quarter (writes one quarter on the chalk board), ok now today let us ah first of all discuss ah place values of decimal points, ah decimal fractions (rubbing on the chalk board)*
S4: *ah, sir,*
Mr. Otani: *yes*

S4: *why is it that (not clear) one hundred, just say that by multiplying zero point two five*
Mr. Otani: *yes*
S4: *we are going to move to the right to two decimal, ah, to two decimal ah, to two decimal places*
Mr. Otani: *ok, ah*
S4: *instead of multiplying, because if we have multiplied twenty five by a hundred, we have already ah used that fraction as a whole number*
Mr. Otani: *ok*
S4: *yah*
Mr. Otani: *yah ah akuti what if we can just shift this decimal place to (pointing on the sum) here then you add how many zeros down!*
Ss: *two*
Mr. Otani: *two, is it?*
S4: *yah two zeros down*
Mr. Otani: *ah so just shift like this one, two then after that you add zero zero (adding two zeros to one) so what are you doing here?*
Ss: *every body speaking (not clear)*
Mr. Otani: *you are just multiplying by a hundred, you are doing the same, you are multiplying by a hundred, you want to make this one to be a whole number (pointing to 0.25), isn't it!*
Ss: *yes*
Mr. Otani: *so you are multiplying this one by a hundred and this one by*
Ss: *hundred*
Mr. Otani:*: is it clear? (pointing at the student who asked)*
S4: *yes, its clear*
Mr. Otani: *ok*
S2: *what about, ask*
Mr. Otani: *yes*
S5: *sir what about if …*
Mr. Otani: *what?*
S5:
Mr. Otani: *(laughing), ok ah one, this one, this one*
S5: *yes*
Mr. Otani: *explain to him or her that each and every whole number or each and every whole number is over!*
Ss: *one*
Mr. Otani: *one, and if you divide that one into that number, the result will be the very same number, so if you write any number, like one it simply means one over!*
Ss: *one*
Mr. Otani: *one into one which is*
Ss: *one*
Mr. Otani: *if you write twenty five, its twenty five over one, one into twenty five*
Ss: *twenty five*
Mr. Otani: *twenty five, yes*
S6:

Mr. Otani: *ok, ah during multiplication of, when we are discussing multiplication of decimal fractions, in secondary schools, eti, ok, kuno sitinapange koma ku secondary school, if you multiply by this number by a whole number, then you count how many decimal places eti*
Ss: *yes*
Mr. Otani: *so if you are going to count, going to multiply this by a hundred the answer will be two thousand and what!*
Ss: *five hundred*
Mr. Otani: *and the moment you write this two thousand five hundred it simply means two thousand five hundred point zero, zero, zero, So since we are having how many decimal places!*
Ss: *two*
Mr. Otani: *one, two, then we want to shift that decimal place, ah decimal point to, to our left what!*
Ss: *left side*
Mr. Otani: *that is why (shifting decimal point to the left two places) we shift this point here up to here so if twenty five over (pause)*
S5:
Mr. Otani: *any other questions, now today let us first of all discuss the place, place values of decimal fractions (writing on the chalk board the section), place values of decimal fractions, so when we are discussing addition, subtraction, or in short, basic operations of whole numbers, we first discussed place value of each digit in that number, lets say we have three hundred and twenty one, how many digits do we have here*
Ss: *three*
Mr. Otani: *so this digit, the first digit is under what!*
Ss: *ones*
Mr. Otani: *this one!*
Ss: *tens*
Mr. Otani: *this one*
Ss: *hundreds*
Mr. Otani: *if we can add here it will be what!*
Ss: *thousands*
Mr. Otani: *then*
Ss: *ten thousands*
Mr. Otani: *ten thousands ten thousands, ok!*
Ss: *hundred thousands*
Mr. Otani: *hundred!*
Ss: *thousands*
Mr. Otani: *then thousand thousand!*
Ss: *million*
Mr. Otani: *it will be what!*
Ss: *million*
Mr. Otani: *ok, now let us go this side now, we have one after the ones here!*
Ss: *tenths*
Mr. Otani: *why the tenths not ones*

S7: *they are fractions*
Mr. Otani:*: why tenths not ones*
S7: *because one is already there*
Mr. Otani: *aha, one is already there, so moving from one to this side, we have all, we have fractions now going this side, so we start with*
Ss: *tenth*
Mr. Otani: *tenth aha!*
Ss: *hundredth*
Mr. Otani: *hundredth aha1*
Ss: *thousandth*
Mr. Otani: *(writing thousandth) aha,*
Ss: *ten thousandth*
Mr. Otani: *(laughing) ten*
Ss: *thousandth*
Mr. Otani: *thousandth, eti aha*
Ss: *hundred thousandth*
Mr. Otani: *hundred thousandth, then thousandth*
Ss: *ayi (laughing) millionth*
Mr. Otani: *millionth, ok now let us say we have two three seven point eight nine two, let us write the, let us put this number into the place value ok this one should be what! (point at two on the right side)*
Ss: *every body speaking*
Mr. Otani: *ok, let us begin with the ones, let us begin with the ones, this one (point to seven)*
Ss: *ones*
Mr. Otani: *here seven, aha!*
Ss: *tens*
Mr. Otani: *(writing three under tens) tens*
Ss: *hundreds*
Mr. Otani: *what*
Ss: *hundreds*
Mr. Otani: *what about this one (pointing at eight)*
Ss: *tenths*
Mr. Otani: *(writing eight in the tenths column) aha!*
Ss: *hundredths*
Mr. Otani: *(writing nine in the hundredths column) pointing at two*
Ss: *thousandth*
Mr. Otani: *(writing two under thousandth) ok is it good for us to put a decimal point here (pointing between ones and tenths)*
Ss: *no*
Mr. Otani: *why not, why not?*
S6: *because we have already written the place values*
Ss: *mumling in disagreement*
Mr. Otani: *place value that means if you put this h, the small h at the end here (pointing at the h on the tenth) it simply means this one is a fraction, tikumvana*
Ss: *yes*

Mr. Otani: *what about ah zero point seven six who can come in front and write this in the place value chart, yes (student going to front and writes) correct?*
Ss: *yes*
Mr. Otani: *ah*
S7:
Mr. Otani: *here is a question, is there a problem if we omit this one (pointing at the zero on zero point seven six)*
Ss: *(some saying yes, others no)*
Mr. Otani: *why*
Ss: *some saying is representing the whole number, while others disagreeing, every body speaks*
Mr. Otani: *yes, (points at a student)*
S7: *whether you omit it or not it's the same*
Mr. Otani: *whether you omit it or not, it's the same*
S9:
Ss: *laughing*
Mr. Otani: *alright, alright, alright, ah this one is just representing the value of a certain number, isn't it!*
Ss: *yes*
Mr. Otani: *zamveka*
Ss: *yes*
Mr. Otani: *ok (rubbing off the board) now let us come to basic (writing on the chalk board) operations of decimal fractions, let us start with addition, when we introduce the addition of decimal fractions, let us say we have this sum seven plus two, seven plus two (writing) equals nine, then you want to introduce this sum using a number line, how can you introduce this sum using a number line, yes*
S9: *ah, we first of all draw a number line*
Mr. Otani: *we first of all draw a number line, aha*
S9: *we indicate the numbers, we divide it into two parts, the number line divide it into two equal parts, the positive ones and negative ones*
Mr. Otani: *ok, let us divide it, so we have zero here so going that side we have!*
Ss: *positive*
Mr. Otani: *ah so here its one, two, three, four, five, six, seven, eight, nine, ten. What about here (pointing the other direction of the number line, writing negate one, negative two, negative three), aha, happy with this number line? Yes*
S9: *we want to model our figures and we start from zero, we jump up to zero then where our seven is on the number line and thereafter we add two*
Mr. Otani: *you get … or we are going to stand where there is a (pointing at zero)*
Ss: *zero*
Mr. Otani: *you have drawn this number lino on the ground eti!*
Ss: *yes*
Mr. Otani: *then let the pupil stand on this point zero, then you ask him or here to move, how many steps!*
Ss: *seven*
Mr. Otani: *seven steps, so from here seven steps, one, two, three, up to!*
Ss: *seven*

Mr. Otani: *seven now after that*
Ss: *then add two, some say tell her to add two steps and some say tell her to move two steps*
Mr. Otani: *what?*
S10: *to move two steps then ask him or her that*
S9: *how many steps*
S10: *have you jumped because sometimes …*
Mr. Otani: *ok, so you ask him or her to move two more what!*
Ss: *steps*
Mr. Otani: *that means from seven, eight then nine then after that*
S9: *ask him or her what number have you landed*
Mr. Otani: *ok so in this case our answer is!*
Ss: *nine*
Mr. Otani: *so akanena kuti tafika pano pali chani kodi!*
Ss: *nine*
Mr. Otani: *nine, is it in English or Chichewa*
Ss: *Chichewa*
Mr. Otani: *Chichewa eti*
S11: *masamu a ku okhetsa*
Mr. Otani: *ehe, (laughing) ok that's how you can introduce this one using a number line, now let us say we have instead of whale numbers we have zero point seven plus zero point two (write equals), zero point seven plus zero point two our answer is what!*
Ss: *zero point nine*
Mr. Otani: *zero point*
Ss: *nine*
Mr. Otani: *nine, now how can you teach this one using a number line, yes*
S2: *I think that one, ah we can still draw that number line, we can just draw from one, two*
Mr. Otani: *from one*
S2:
Mr. Otani: *from this one*
S2: *yah*
Mr. Otani: *ok, ummhu*
S2: *yes*
Mr. Otani: *here is what, zero ummhu*
S2: *then you write small lines, can I … (student writing on the board what he was trying to say) then first of all we are going to tell our learner to stand at this point where we have a zero and we are going to tell that one to at least move seven steps to this side of the line that means start from here (zero) move one, two, three, four, five, six, seven it means at this place going to start here and stop here, so this means that this is still a fraction because we haven't reached the whole number and thereafter we are also going to ask that learner to move two more steps from this one, so it means start from here to here and here and then we are going to ask him to how many has he jumped. That means he will be able to see that he is at zero point nine because he hasn't reached the whole number, … but because these are the numbers between zero and one,*

so he is moving within this limits (i.e. 0 and 1) so its still a fraction, he hasn't reached the whole number

Mr. Otani: *thank you very much*

Ss: *clapping has for him*

Mr. Otani: *so instead of drawing a number line from here up to two here, you can just draw your number line unnhu then here you indicate that it is zero and here is what!*

Ss: *one*

Mr. Otani: *one, then between zero and one you mark how many points*

Ss: *some say nine while some say ten*

Mr. Otani: *yah, nine points, so its one, two, three, four, five, six, seven, eight, nine then this one simply means that each point is a, a fraction why because we are, we are in the range between zero and one which is a whole number, so you let your pupil to stand on zero and ask him or her to move how many steps!*

Ss: *seven*

Mr. Otani: *seven steps, one, two, three up to*

Mr. Otani & Ss: *seven*

Mr. Otani: *then ask him or her to add how many more steps*

Ss: *two*

Mr. Otani: *ndiye kenako mumufunsa kuti mwayimapo pali nambala yaji, anena seven, zero point, but first of all you should discuss this one (7 plus 2) eti, izizi ndizoti adapanga kale iwowo, sinchoncho*

Ss: *yes*

Mr. Otani: *you are just revising then after that that's when you introduce decimal fractions, clear?*

Ss: *yes*

S11: *but sir*

Mr. Otani: *yes*

S11: *ah a question comes from the same number line, because assuming that … they can not know, I don't know for them to understand that between zero up to one there is those points …. How can you make that to them you have just indicated that from zero to the other point that you have drawn*

Mr. Otani: *oh alright, alright, here you can, here upon drawing this number line then you write here zero, and here should be zero point*

Ss: *one*

Mr. Otani: *here zero point!*

Ss: *two*

Mr. Otani: *here three up to*

Ss: *nine*

Mr. Otani: *aha, you as a teacher now eti*

Ss: *yah*

Mr. Otani: *eh, ok what if you are given this one, one point three plus zero point six using a number line, ah yes*

S11: *first of all we draw a number line from zero*

Mr. Otani: *aha from zero ok, here zero, here one, here!*

Ss: *two*

Mr. Otani: *eh*
S11: *three ….*
Mr. Otani: *ok … ok, aha*
S11: *there may be*
Mr. Otani: *here?*
S11: *yes then it becomes ten steps*
Mr. Otani: *ok, ten steps*
S11:
Mr. Otani: *ok, from zero, one, two, three, four, five six, seven eight, nine, ten aha*
S11: *then three more steps after one*
Mr. Otani: *ok three more steps one, two, and three*
S11: *six, then from ten there, we are going to write one*
Mr. Otani: *here*
S11: *yes, …. That …. Number one and then move three more steps to that side*
Mr. Otani: *ok*
S11: *then from there let her count again from three more steps to the right from where she is standing*
Mr. Otani: *so first of all he or she should be on the whole number which is what! One by moving from zero ten steps from zero, so ten steps from zero will be here which is what!*
Ss: *one*
Mr. Otani: *one, then after that, let him or her move at, how many steps*
Ss: *three steps*
Mr. Otani: *three steps that is one, two, three so this chap is here standing here (pointing at 1.3), it simply means has moved from zero then beyond one up to ah point what*
Ss: *three*
Mr. Otani: *synecdoche*
Ss: *yes*
Mr. Otani: *aha, but its modeling one point three! Then after that he should add how many steps*
Ss: *six*
Mr. Otani: *six steps, so one, two, three, four, five six now here its zero point*
Ss: *nine*
Mr. Otani: *nine that means at least the pupil will be here which is on zero point*
Ss: *nine*
Mr. Otani: *nine, that is to say if you add one point three plus zero point six the answer is one, this one, point, point what!*
Ss: *nine*
Mr. Otani: *one point*
Ss: *nine*
Mr. Otani: *is it clear*
Ss: *yes*
Mr. Otani: *(rubbing the chalk board) now lets say you want to introduce fractions of decimal fractions using ah place value chart, (writing on the board) what do you place value what!*

Ss: *chart*
Mr. Otani: *chart, what is the difference between place value chart and place value box, what is the difference between place value chart and place value box?, yes*
S13: *place value chart has … while place value chart it's a plane paper*
Mr. Otani: *plane paper*
S13: *yes*
Mr. Otani: *having what and what*
S13:
Mr. Otani: *ok, aha*
S11: *place value box has … values*
Mr. Otani: *ehe*
S11: *then the place value chart is the plane paper where by we indicate the values of decimal values*
Mr. Otani: *if we are talking of a box, you know what a box is, that one should have compartments, it's a box having compartments depending the place what!*
Mr. Otani & Ss: *values*
Mr. Otani: *beginning from one up to … eti*
Ss: *yes*
Mr. Otani: *while a place value chart is just a paper on which you write the … of what! Place value, then you use that ah, that paper for working out the addition of numbers, subtraction of numbers even multiplication of numbers. so a box, a place value box is a box having compartments labeled ones, tenths, hundredths, while a chart is just a plane paper but having what! Al right, let us use this place value chart to teach addition of fractions, let us say we have this one, ah one point zero seven plus zero point six two. We want to use place value chart, how can we use place value chart, first you should write the place value that is on top, eti!*
Ss: *yes*
Mr. Otani: *then tens, then hundreds, then from one going this side!*
Ss: *tenth*
Mr. Otani: *tenth, aha!*
Ss: *hundredth*
Mr. Otani: *hundredth aha!*
Ss: *thousandth*
Mr. Otani: *thousandth, now after having, after writing the heading what you should do is to model those numbers, can use counters, using really objects tikugwirizana!*
Ss: *yes*
Mr. Otani: *aha, so let us model one point zero seven, here under the ones you put how many counters*
Ss: *one*
Mr. Otani: *you put a single counter, one then under the tenth!*
Ss: *zero*
Mr. Otani: *aah, you put zero!*
Ss: *counters*
Mr. Otani: *(laughing), ok just leave it as it is, eti under the hundredth*
Ss: *seven*

Mr. Otani: *seven counters, one, two, three, four, five, six, and seven! So that is one point zero seven, so here you indicate that this one is zero point what*
Mr. Otani & Ss: *seven*
Mr. Otani: *after that, write your plus sign, then you model now zero point six two, how many counters under ones*
Ss: *nothing*
Mr. Otani: *ok, what about tenths*
Ss: *six*
Mr. Otani: *six counters, one, two, three, four, five, six how many counters under tens, oh under hundredth*
Ss: *two*
Mr. Otani: *two, so one, two then here you indicate that this is zero point*
Mr. Otani & Ss: *six, two*
Mr. Otani: *now let us add, let us add, we need to count the number of counters here, counters for here and here, so let us count*
Mr. Otani & Ss: *one*
Ss: *two, three, four, five, six, seven. Eight, nine*
Mr. Otani: *how many counters!*
Ss: *nine*
Mr. Otani: *nine, then you write here, one, two, three, four, five, six, seven, eight, nine here, how many counters!*
Ss: *six*
Mr. Otani: *six, one, two, three, four, five, six under one how many counters*
Ss: *one*
Mr. Otani: *one, now convert ah here into Arabic, its what*
Ss: *one point …*
Mr. Otani: *have one, then write what!, one this one is a fraction, so here you put a point then how many here*
Ss: *six*
Mr. Otani: *six, then write six, then how many here*
Ss: *nine*
Mr. Otani: *nine, then write nine, but you are using the real what!*
Ss: *objects*
Mr. Otani: *objects, is it clear*
Ss: *yes*
Mr. Otani: *mafunso alipo? Yes*
S14: *you have started from the right hand side, ah let us assume that you have got three there, don't you think that, where there is three there … to this side*
Mr. Otani: *ok, wait, wait, wait, we will come to that, osafulumira, tifika kumaneko eti!*
Ss: *ummhu*
Mr. Otani: *oha, ok let us say we have a sum imene amanena awa, you have zero point two nine plus zero point six eight, aha, the what you should do here is to write the place value chart which is have ones, tenths, hundredth*
Ss: *thousandth*
Mr. Otani: *ok, now let us go there under ones*
Ss: *nothing*

Mr. Otani: *nothing, under tenths!*
Ss: *two*
Mr. Otani: *two, one, two, under hundredth*
Ss: *nine*
Mr. Otani: *nine, one, two, three, four, five, six, seven, eight, nine so its zero point two nine, this one under ones, zero then under tenths!*
Ss: *six*
Mr. Otani: *six, one, two, three, four, five, six, under hundredth*
Ss: *eight*
Mr. Otani: *eight, one, two, three, four, five, six, seven, eight, here you indicate that zero point nine, here zero point six eight. Now let us add, under the hundredth, how many one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen fourteen fifteen sixteen seventeen, then here you get one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen fourteen fifteen sixteen seventeen here, here its what!*
Ss: *two*
Mr. Otani: *two plus six which is what*
Ss: *eight*
Mr. Otani: *so it is one, two, three, four, five, six, seven, eight, now since we are dealing with numbers up to base tens eti!*
Ss: *yes*
Mr. Otani: *we are dealing with numbers to base ten, now here we are, we have seventeen counters, what you should do is to get ten counters and make what!*
Ss: *a bundle*
Mr. Otani: *a bundle and transfer this bundle to the*
Ss: *tenth*
Mr. Otani: *tenth, so it will make a single counter, so here let us count the remaining counters, how many here!*
Ss: *seven*
Mr. Otani: *seven, now here how many*
Ss: *eight*
Mr. Otani: *eight!*
Ss: *plus one*
Mr. Otani: *plus one here its what*
Ss: *nine*
Mr. Otani: *then here you write! Nine, what about here*
Ss: *zero*
Mr. Otani: *so its zero point! So apa ndiye pali tchito, making what! A bundle that is regrouping imene tinapanga kale on what! Whole numbers, mafunso, mafunso alipo? Questions, yes*
S15: *ah rearranging the*
Mr. Otani: *rearranging?*
S15: *when rearranging the, when you have made the bundle there so we have added one to there , one counter to be nine counters*
Mr. Otani: *you may do like this, write an arrow then here you write how many!*
Ss: *nine*

Mr. Otani: *nine counters, one, two, three, four, five, six, seven, eight, nine then you write like that, yes*

S16:

Mr. Otani: *yah, use real objects, use real objects, you can have a chart, chart ngati iyi, ok, ndiye ana aja, azikatenga ma objects kukayika, funso lina, ok (rubbing the chalk board) ah (writing sum on the board) wina abwere adzatipangire sum iyi, that one, (student writing on the board – friends laughing)*

S16: *yah we are dealing with this problem, we want to solve this problem, now ah, first of all we are going to write place values, so ah in this case we write the ones, then tenth, hundredth, ah thousandth, ah then we indicate how many ones are there, how many ones would we write there*

Ss: *three*

S16: *so here we write one, two, three, then how many tenth*

Ss: *six*

S: *six, so one two three four five six, then how many hundredth*

Ss: *five*

S: *five, one two three four five ah then have this one two point five six, so how many ones are there*

Ss: *two*

S: *so one two, how many tenth*

Ss: *five*

S: *five, one two three four five, ah how many hundredth*

Ss: *six*

S: *six, one two three four five six, then we add, then here we indicate this is representing ah three point six five, and this one is representing two point ah five six, let us add ah lets count together one, two, three, four, five, six, seven, eight, nine, ten, eleven, so we write here one, two, three, four, five, six, seven, eight, nine, ten, eleven, then here let us add, we all count,*

Ss: *one, two, three, four, five, six, seven, eight, nine, ten, eleven,*

S: *so we write one, two, three, four, five, six, seven, eight, nine, ten, eleven, then here one, two, three, four, five, one, two, three, four, five (writing on the chalk board), then here we should ah since we are dealing with numbers that are base ten, here we should count one, two, three, four, five, six, seven, eight, nine, ten, then we tie a bundle, this one should be a bundle then ah after we make a bundle there we transfer this bundle to this then you add one there, ah so here we are having how many objects remaining*

Ss: *one*

S: *one, so here we indicate what! One, there ah, here we are having one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve then we have also to tie a bundle because they are more than ten, since we are dealing with numbers which are base what!*

Ss: *ten*

S: *ten one, two, three, four, five, six, seven, eight, nine, ten then we also tie a! bundle, then here we two so here we write what! Two good, here we should transfer this bundle to here then we count one, two, three, four, five, six the here we write what!*

Ss: *six*

S: *six, but don't forget a decimal point here, so ah this is how to model this one, any questions*

Mr. Otani: *ok, thank you very much, thank you very much, I hope its clear alright, alright, then we can call it a day*

APPENDIX C: EXAMPLES OF REFLECTIVE INTERVIEWS

MR. OTANI

Researcher: *so like I said we are going to use the first and the second lesson of course we are also going to refer to the third lesson as well, ummhu may be for the start I just wanted to find out anything that interested you most in your classes*

Mr. Otani: *ah*

Researcher: *anything that interested you most in your classes, what was like the interesting thing that you saw in your classes or that you think that this was more interesting*

Mr. Otani: *ok laughing, ah its, ah it's the performance of students more especially when they were explaining aha during peer teaching or during explanation, so the way there were explaining very interesting*

Researcher: *ok what about the difficulty, any difficulties, any general difficulties that you came across, or the challenges that you met*

Mr. Otani: *yah the challenges were many such as language problem to students and language problems to I myself as a teacher, sure and the use of teaching and learning materials some of them were not properly*

Researcher: *may be if you can just elaborate more on the language challenges that you met both in terms of you yourself and the students*

Mr. Otani: *yah, since English its not our mother tongue language we may face some difficulties sometimes in explaining the point, even the pupils, the students they may face the very same problem but mostly the students face a lot of problems when explaining*

Researcher: *ummhu*

Mr. Otani: *sure*

Researcher: *so anyway , may if we can just recall from some of the, from some of these lessons, the first or second, third or the fourth lesson may be have may be like the specific examples like saying when we were doing this somebody failed to explain this or may be to your side may be when you were talking about this, this, the language problem came about, came because of this, something like that*

Mr. Otani: *ok ah during the time the female student was explaining how to model ah a certain problem she had a lot of difficulties to explain how the process was going on so that's now of the*

Researcher: *ok yah I remember it was the first or second lesson,*

Mr. Otani: *I think it was*

Researcher: *the second lesson*

Mr. Otani: *yah*

Researcher: *But how could you help such type of student teachers (who fail to express themselves) because the student knew the stuff, you could see that she knows the stuff but she couldn't explain*

Mr. Otani: *ah its simple you can allow her or him to speak in the mother tongue*

Researcher: *the mother tongue*

Mr. Otani: *ehe the mother tongue*

Researcher: *so its like that time if she could have switched to Chichewa, it couldn't have been a problem*

Mr. Otani: *ah no problem, no*
Researcher: *ok ,but but why were they not like switching to Chichewa themselves, for example today's lesson*
Mr. Otani: *yes*
Researcher: *that boy*
Mr. Otani: *laughing*
Researcher: *he wanted to explain in, he knew what he wanted to explain but he couldn't explain in English and he even said he couldn't explain in Chichewa, why don't they themselves say they feel that they cant explain in English may be before you say or telling them can you explain it in Chichewa or Chitumbuka, why don't they may be just switch*
Mr. Otani: *to chichewa*
Researcher: *to Chichewa without may be*
Mr. Otani: *ah,*
Researcher: *waiting for you to say switch*
Mr. Otani: *ah, it's because they are used to speak in English they know that this is college, they cannot be allowed to speak in Chichewa,*
Researcher: *ummhu*
Mr. Otani: *aha, that is why they speak English, they switch to another language unless if they are given that freedom*
Researcher: *without that they cant*
Mr. Otani: *ah they can't*
Researcher: *laughing ok umhhu, I don't know before you go to class you also have lesson plans*
Mr. Otani: *ah not really lesson plans but just a matter of planning somewhere*
Researcher: *ummhu, ok I wanted to find out if may be was there anything that you feel that you did something may be different from the way you planned it may be because of something else that happened in the class or you just switched*
Mr. Otani: *yes, sometimes yes*
Researcher: *ummhu*
Mr. Otani: *like the first lesson I was trying to explain the meaning of a digit and a number it was outside my plan*
Researcher: *ummhu*
Mr. Otani: *aha, it was outside my plan but I realized that they don't know the meaning of a digit so I was trying to revise*
Researcher: *ok, ummhu mat be just for few minutes*
Mr. Otani: *yes*
Researcher: *may be using this lesson, ,may be before I ask what I wanted to ask, I just wanted to find out what were like the objectives of this lesson, not necessarily recalling them but just generally what did you want to achieve in this lesson*
Mr. Otani: *ok by the end of the lesson I wanted these students to hear or to solve this problem, ah decimal problems first they should by the end of the lesson, I don't know how I can explain myself*
Researcher: *or may be the reason that am asking this question is the because the way like you were presenting it was like*

Mr. Otani: *yes*
Researcher: *it was like the actual teaching of the*
Mr. Otani: *yes*
Researcher: *it was like they themselves are students*
Mr. Otani: *are students, yes*
Researcher: *they are like primary pupils*
Mr. Otani: *yes*
Researcher: *that's how you were presenting it so that's why I was saying what were the objectives of this lesson because now from that I can get a clear say that we use this may be because of this*
Mr. Otani: *ok, the aim was first to impart knowledge of how they can conduct the lesson in classrooms, after that its when we come to the part where you can allow them to express themselves or to teach as they have been taught*
Researcher: *now like on the issue imparting on them knowledge it was you were using like the number lines, the, the counters*
Mr. Otani: *yes*
Researcher: *what type of knowledge is it academic or*
Mr. Otani: *that one its methodology*
Researcher: *its methodology*
Mr. Otani: *methodology yes*
Researcher: *so what was the aim behind it, is it may be I should*
Mr. Otani: *laughing*
Researcher: *may be if you can elaborate more what is the purpose because it is not an academic knowledge eti*
Mr. Otani: *yes*
Researcher: *its something like a methodology but you were doing it step by step, it was like, I don't know if you get what am saying*
Mr. Otani: *laughing*
Researcher: *like these students they are form four students they have already gone through this stuff*
Mr. Otani: *yes*
Researcher: *they know it although some students seemed like they don't know the stuff, but not every body they were not many*
Mr. Otani: *ok*
Researcher: *yah but so its like, when you were presenting the material it was like you were doing everything*
Mr. Otani: *step by step*
Researcher: *yah, so I was just interested, what is the aim*
Mr. Otani: *yah, the aim is to take everyone in that class so that they should <u>outlook</u> or they should learn how they could go about teaching that lesson*
Researcher: *so in other words can we say that you teach them, so I was asking like can we say you teach so that, so I was saying kuti can we say awa akupanga zimenezo kuti they should imitate what you were doing*
Mr. Otani: aha, yes
Researcher: *its like they should observe you and*
Mr. Otani: *they should do the same*

Researcher: *ok so the assumption is that, anyway let me ask if you say for example these are the students and you just go in class and say ok so anyway, just explaining like this is the way we go about it after explaining everything, but may be not necessarily going into all those*
Mr. Otani: *details,*
Researcher: *I don't know how do you look at it, of course am not saying what you were doing was wrong*
Mr. Otani: *laughing*
Researcher: *but its just a matter of interest*
Mr. Otani: *its just, just explaining to them without going into details*
Researcher: *yah like the way you are doing*
Mr. Otani: *ummhu its difficult for them to have a clear picture of what is going on*
Researcher: *ok so its like they have to see from you*
Mr. Otani: *yah*
Researcher: *so its like, you act like a mentor*
Mr. Otani: *may be laughing*
Researcher: *so in other words we can say you should go and teach as I teach*
Mr. Otani: *ah, no, no, its not like that, its not like that*
Researcher: *its not like that*
Mr. Otani: *ahaaha no its not like that*
Researcher: *that's what they are going to do*
Mr. Otani: *laughing*
Researcher: *because they were copying everything, and every step they were copying them down it means when they go to their schools and then they give them or they find themselves that they have teach this topic*
Mr. Otani: *yes*
Researcher: *they will do as you have done*
Mr. Otani: *laughing but the main aim is, we are doing this because of two things one the at the end they have to write exams and they can not do well if they don't do what we did in the lesson ah, secondly they should apply this knowledge wherever they will go*
Researcher: *ummhu*
Mr. Otani: *yah*
Researcher: *ok, so do you like do you tell them that for example this is or when you go their don't just copy what I am doing or*
Mr. Otani: *laughing*
Researcher: *or whatever you are doing here its just apply it you can use*
Mr. Otani: *anything ehe*
Researcher: *ok, now from like this lesson, anyway azikhalangati mafunso ake obwereza bwereza*
Mr. Otani: *eya*
Researcher: *koma timafuna kuti using the other angle, kuti like from this lesson eti kuti what do you expect your students to be able to do I don't know if you can see the difference between this lesson and the previous one kuti like kuti mwa phunzitsa eti*
Mr. Otani: *eehe*

Researcher: *so its like kuti muthu umakhala ndichiyembekezo kuti mmene ndaphunzitsira inemu I think ma students awa they should be able to do this, for example may be if you can give him muthu wina wake chinachake or the same topic kuti aphunzitse chithu chimene unachichalilira kuti they should be able to do this akapanda kupanga nawenso umakhumudwa kuti ah kuphunzitsa konse kuja muthu uyu*
Mr. Otani: *angopanga zakezake*
Researcher: *eehe, so that's what am asking*
Mr. Otani: *eeh zoonadi*
Researcher: *what were you expectations that this is what they should or if say you give somebody the same or what you were doing here, and give one of the students to do exactly the same thing what is it that you would expect them to do*
Mr. Otani: *eeh, laughing komatu limenero mlosautsa zedi kuyakha kwake laughing*
Researcher: *laughing, lonsatsa, ok, koma mwina chifukwa choti papita nthawi, koma we can use this like lesson ya lero ija that atleast you are still fresh eti you can recall it that tapanga za multiplication of decimals and the division of decimals*
Mr. Otani: *and then division of decimals*
Researcher: *so its like what would you, or what are your expectations kuti ma studentswo at least they should be able to do this, this, this*
Mr. Otani: *aha, monga kuti athe kumakafotokozera ana mmene tingachitire times wa decimal fractions and division of decimals, ehe cholinga chake nchoti atha kukatsata njira zimenezo kuti akafotokozere ana*
Researcher: *ummhu*
Mr. Otani: *sure*
Researcher: *ok, ahh now like today eti, lesson ya lero yonena kuti you are through with the decimals, just a matter of interest I just want to know your side, your views, your feelings how do you feel are your students well prepared that if they go to the, to the primary school and they are given that topic of decimals do feel that they are well prepared to meet*
Mr. Otani: *yah ahh they are, they are laughing they are*
Researcher: *laughing they are, how do you assess that, what gives you confidence to say these will be able to do it*
Mr. Otani: *ummhu, ikadakhala kuti we should have peer teaching whereby we have some students teaching other students, but since we are, I should say our, our syllabus its not allowing us to do that because of congestion of topics we have a lot of topics and we are still in handbook one but this is second term, so we have handbook 2 and handbook 3 zosayamba ehe so we are trying to move fast*
Researcher: *ok so its like after this, they way you are saying they are supposed to*
Mr. Otani: *ehe prepare a lesson and present a lesson, aha*
Researcher: *so like in the absence of that is there any effect or any will that not have any effect to the students*
Mr. Otani: *to these students*
Researcher: *yes*
Mr. Otani: *ah, no, no*
Researcher: *it cant?*
Mr. Otani: *ah no*
Researcher: *ok*

Mr. Otani: *sure*
Researcher: *ummhu ok so the other thing that I wanted to find out is can you foresee any challenges like these students the way you have taught them, the way like or the way you know the topic any like language issues or language challenges that you see that they might face this problem or they might meet this as difficult in this topic like the decimals*
Mr. Otani: like the decimals
Researcher: ummhu
Mr. Otani: *ah yah its some of them will try to model other some problems which is very difficult for them to model like you want to model multiplication, modeling multiplication is very difficult unlike modeling whole numbers, modeling whole numbers is very simple but to model multiplication, ah to model multiplication involving decimals is very difficult, so these are the challenges, yah*
Researcher: *ok, ummhu, ok so anyway on the topic, like the question that I want to ask now eti, is still on the language but now not in the sense that using Chichewa or Chitumbuka or English, not in the sense kuti akanika kupanga explain chifukwa chithu sakuchidziwa bwino bwino eti, komano in the sense kuti muthu uja ali fluent mu English bwino bwino ok komano ndi kumakumana ndi ma challenges ena ake for example , I don't know if it was your lesson, panali ujeni ina yake yonena kuti 2 into 1, the expected answer was impossible, impossible then ok you write zero, now is zero equal to impossible or is impossible zero those challenges, a language issue eti, coz its like what is the meaning of impossible what is the meaning of this, like that eti, so this question is like from this topic from this topic of decimals I just wanted may be just to find out like from you what you think are the language challenges in that sense would be or these teachers would meet when they go into various schools, considering now the students are fluent in English or whatever language they will use , I don't know if you have ever thought about that*
Mr. Otani: *aha ehe, funsotu limenelo mlosautsa*
Researcher: *laughing*
Mr. Otani: *losautsatu limenelo*
Researcher: *ok, ummhu may be another one would be, anyway I am biased towards language eti*
Mr. Otani: *yes*
Researcher: *because that's the area am looking at*
Mr. Otani: *yes*
Researcher: *with the other thing I would ask you that, I don't know from like from your presentations all these lessons*
Mr. Otani: *yes*
Researcher: *what would be like that the language issues like that, these students developed just to improve like their communication, just to improve their communication, to improve communication in the sense that for example if they go ku primary kuja kuti akaphunzitsa the same topic ya ma decimals, they should be able to communicate kuti ifike point yoti ma students aja achipange grasp, ndikuchimva chithu chija eti, so I was saying kuti ah, ok what language skills or do you see kuti pali any language skill yoti yachitikapo ndithu they would be able to communicate the*

mathematics when they go ku primary kuja maka maka this topic kuti they will be able to deliver the material

Mr. Otani: *yah at the end of each lesson, students learn a language skill, for example they have accumulated vocabulary more especially on decimal like placing decimal places, moving to the right, according to the number of decimal places, so that's an accumulation of vocabulary in this topic*

Researcher: *ok so it was like at least they have acquired*

Mr. Otani: *something*

Researcher: *something ok, ah I don't know may be apart from the students presenting, kupita ku tsongolo kuja presenting the problem or what ever do you have any methodologies that you employ just to improve their communication skills*

Mr. Otani: *yah, you may put them in groups so that they can discuss in their groups so as they are discussing they may have they may acquire some skills*

Researcher: *ok, what else could you or what else do you feel that may be ndikanapanga zakuti zakuti or ndikanapanga chakuti chakuti sindinachipange ukuku kuti or mwina kuti lesson ija ukamaliza ukabwera kuno kuti ah mwina pajapa ndikanapangako chakuti chinja*

Mr. Otani: *eeh zimatero kumene monga lesson yoyamba ija tamaliza ndimanganiza kuti ah koma anyamata amene aja nkadawayika mma gulu so that they should do ah modeling practically akanatha ku mvetsa bwino kwambiri unlike just explaining*

Researcher: *ok anything else may be apart from that, in these other lessons like the second lesson or the third lesson and the others*

Mr. Otani: *ok chinanso ndi choti at the end of every lesson, pamafunika some sort of assessment to asses whether they have understood or not so zimenezi ndizoti (not clear)*

Researcher: *so like you said the next, like tomorrows class would be percentages,*

Mr. Otani: *yes percentages*

Researcher: *will it be the same approach*

Mr. Otani: *laughing, it will be the same approach laughing*

Researcher: *the methodology approach why are you not say adding the academic knowledge*

Mr. Otani:*Otani: this academic knowledge, these people are able to do academic material but they are lacking methodology and that is why we concentrate on methodology*

Researcher: *ok*

Mr. Otani: *sure*

Researcher: *so the percentage topic is (not clear)*

Mr. Otani: *(not clear)*

Researcher: *anything may be that you would want to add on the lessons that we have observed may be I didn't take note of it, but anything that you see that it's a language issue or any language that ikhoza kuwaphunzitsa ma students wo eti their communication or we see that this is a problem yonena kuti yonena kuti may be from what we have discussed sindinayipange tackle*

Mr. Otani: *ah kumakhala kovuta nanga siguleyo ukamavina ndiwe*

Researcher: *laughing*

Mr. Otani: *gule ukamavina ndiwe pamakhala povuta kuti udziwe kuti apapa*

Researcher: *ummhu*

Mr. Otani: *zimakhala zosautsa*
Researcher: *ok*
Mr. Otani: *sure*
Researcher: *kodi kuno muli ndi library*
Mr. Otani: *yes*
Researcher: *what type of books do you have*
Mr. Otani: *ummhu sindingafotokoze (I cant say) chifukwa sindimapitako*
Researcher: *kupitako eti*
Mr. Otani: *eehe*

MR. CHIPASULA

Researcher: *mainly from the four lessons that we have observed ah I just wanted to find out may be from you the most, the most difficult thing that may be you came across in your teaching*

Mr. Chipasula: *laughing, I thought it will be you saying that*

Researcher: *laughing ah nanga zimatheka eti, kuti after lesson ija eti or when you come out of that lesson you say koma that thing or mwina simumachiyembekezera kuti chikhoza kuchitika eti laughing*

Mr. Chipasula: *laughing, ok, ah I think tinayamba ndichani ok ma introduction a ma decimals ati anapanga kaye ndi a Kwerenge ndiye ife timangopitiliza ummhu*

Researcher: *I think inali iyiyi, and then the second one was this one the second one was the addition of decimals I think was it*

Mr. Chipasula: *yah it was I think yah*

Researcher: *converting of*

Mr. Chipasula: *yah converting of decimals to fractions*

Researcher: *and the third one was basic operations eti*

Mr. Chipasula: *yah*

Researcher: *ok, just anything I know I have taken you by surprise laughing*

Mr. Chipasula: *like on modeling some were saying for tenth we will cut the sticks and when you give these things to say discuss they discuss mostly in local language but when you say what have you come up with they will switch on to English*

Researcher: *but why is it so? Chifukwa chiani atakhala kuti muthu wina oti is failing to express himself in English or Chichewa akapanga paja eti, suppose kuti cant express himself in English koma still they speak in English. Why don't they switch to Chichewa or Chitumbuka on their own may be without waiting for you to say use the local language*

Mr. Chipasula: *may be because of the other subjects may be they emphasize on the use of English*

Researcher: *ok so they think*

Mr. Chipasula: *because the moment you say can you tell us what you have agreed they automatically switch to English*

Researcher: *but if now somebody says explain in Chichewa how would you take it?*

Mr. Chipasula: *with me no problem*

Researcher: *no problem*

Mr. Chipasula: *yah*

Researcher: *oh ok, anything that was may be difficult, the most difficult thing? laughing*

Mr. Chipasula: *ummhu ok what, what I think its difficult to come up with something just may be because during these days have I was too busy, I was extremely busy*

Researcher: *ok yah ummhu the other thing that, ah not the other thing but the first thing that I observed is that in your class its its arranged in groups*

Mr. Chipasula: *yah*

Researcher: *students are arranged in groups and akangolowa paja everybody goes straight to his or her seat so I just wanted to find out, first of all I just wanted to find out why did you choose to group them?*

Mr. Chipasula: *to group them*
Researcher: *yes*
Mr. Chipasula: *I think its easier to say now be in groups unlike if they are in their routing way of sitting like each one on his or her desk when you say now be in groups amatenga thawi and they make a lot of noise.*
Researcher: *oh ok so just decided kuti tingopangiratu ma group*
Mr. Chipasula: *ma group, if there is something for group discussion its easier you just say ok now can you discuss in your group. But I think it still has a disadvantage because sometimes when you are using the chalk board and one is facing this side sometimes it doesn't work well.*
Researcher: *so it, it do you use this class only or you use*
Mr. Chipasula: *I use one period per week in class seven but there we also encourage them desks to put the desks in groups*
Researcher: *so what happens when somebody comes in, like this time there is somebody*
Mr. Chipasula: *sometimes they understand they teach in groups sometimes they rearrange the desks.*
Researcher: *ok so its like the students they know that ikangokhala period ya maths they automatically arrange the desks in groups.*
Mr. Chipasula: *yah like with what IPTE 1 group which is now in the field they used to arrange before I come*
Researcher: *ok*
Mr. Chipasula: *yes and class 5 its mathematics only we teach according to class*
Researcher: *owwo,*
Mr. Chipasula: *so the rooms have been allocated to subject but since some we have 2 rooms per subject and have 4 mathematics teacher educatorss teaching that subject and you find out that they teach at 1 particular period in a day so sometimes they use these other subjects like that other class I think one uses for what agric I don't know today*
Researcher: *ok*
Mr. Chipasula: *yah*
Researcher: *ok the other thing that I wanted to find out on the same issue of groups umm is it always the case that they need to be in groups or may be it depends on the topic that you are teaching*
Mr. Chipasula: *it depends on the topic sometimes when I feel that the topic is too content, like the time we were discussing surds so I think I wanted individual reasoning more of individual reasoning so that I can easily asses each learner*
Researcher: *so when do you normally use the groups*
Mr. Chipasula: *when am sure that the stuff is for primary school and that everybody knows the stuff, yah*
Researcher: *ummhu ok and then I noted that after their discussions what I noted was anyway you collect me if am wrong*
Mr. Chipasula: *yah*
Researcher: *it was like you were the one saying iwe ukhoza kutipangira present instead of iwowo kuti they choose their representative to present what they have discussed.*
Mr. Chipasula: *kuti lero atipangirako ndiwakuti*

Researcher: *laughing yah I just wanted to find out why why is it so is it kuti zimangochitika or you had planned to do that and why*
Mr. Chipasula: *ah no, sometimes I I give them freedom to choose but sometimes they wait ah which one laughing so that's why sometimes I just say wakuti*
Researcher: *oh ok*
Mr. Chipasula: *so when they are delaying I can just point out to say this one can you tell us about what you were discussing and sometimes I do this because I want them to actively participate instead of just remaining silent without following what their friends are discussing*
Researcher: *so its like everybody should be alert*
Mr. Chipasula: *yah*
Researcher: *that I can be picked at any time*
Mr. Chipasula: *yah*
Researcher: *ok but also I wanted to ask who grouped these students was it you or just say kuti*
Mr. Chipasula: *they group themselves but I would make some changes that you be here you be there*
Researcher: *so what were you looking for how did you make the groups*
Mr. Chipasula: *at first as I have already said I just say be in groups so sometimes I notice that awa akusewera kwambiri awa akupanga bwanji or may be group ina yake ikumakhala yotsalira lotani so sometimes I change, awo amene amaoneka pagroupo ambiri ndiwochenjereko zochitika mwina kuwasitha, yah*
Researcher: *ok I also I was also interested to know kuti did you consider any issue of language when making these groups*
Mr. Chipasula: *ah no i didn't I didn't ask you where you come from so I didn't*
Researcher: so can it be possible in one group to be a chewa okhaokha or a Chitumbuka okhakha?
Mr. Chipasula: *may be its possible I have not checked I think that's a good observation I will try to check*
Researcher: ok,
Mr. Chipasula: *but majority are from kasungu north and mzimba south so majority are Chitumbukas*
Researcher: so its possible to find which is all Chitumbuka
Mr. Chipasula: *at least one or two*
Researcher: *ehh*
Mr. Chipasula: *but its also possible to have a group of all Chitumbukas*
Researcher: *so you cant get anywhere, like when you are moving around the class muja do you here , how do they discuss, do they use Chichewa or Chitumbuka.*
Mr. Chipasula: *they mix*
Researcher: *Chichewa and Chitumbuka*
Mr. Chipasula: *but they use too much of Chichewa than Chitumbuka*
Researcher: *owo*
Mr. Chipasula: *yah*
Researcher: *ok then what was the other thing, ok the other thing was on the material that you were teaching, like if we go back to the first lesson we see that koyambilira, koyambirila you taught something like content ii not the content but the methodology*

Mr. Chipasula: *methodology*
Researcher: *yah it was like how would you introduce, how would you introduce this*
Mr. Chipasula: *yah*
Researcher: *but now after that, it was, you were now actually teaching them*
Mr. Chipasula: *yah*
Researcher: *yah it was like it was … so it was like you combined the two the methodology and the content*
Mr. Chipasula: *the content yah*
Researcher: *so but on the content but part in the first lesson and the second lesson when you are teaching them like you would teach the*
Mr. Chipasula: *the children laughing*
Researcher: *the primary*
Mr. Chipasula: *pupils*
Researcher: *yah even the material ndiyoti akuyidziwa kale, I just wanted to find out why do you actually do that, what is the aim for doing that?*
Mr. Chipasula: *unn the aim is I think since they will be teaching the primary school so sometimes we I give them procedure or I want to check do they really know if I am using the, if I am asking them questions. do they know this one, because I believe that if they how to solve it they can easily teach, so I would check do they know this step what about this one, what about this one so if am convinced that they know all these steps, I am sure that they can easily teach (knowing the procedure means they can teach)*
Researcher: *so its if you may be notice that may be thawi zina sizikuyenda what do you do, do you actually teach*
Mr. Chipasula: *yah, laughing*
Researcher: *ok the other thing that I also wanted to find out is anyway ok like on the same issue of content how do you know that that of course you said that your aim is to check eti if ngati material akuyidziwa or ok by asking them you know kuti apapa*
Mr. Chipasula: *apapa zikuyenda or apapa ayi*
Researcher: *but I wanted to find out kunena kuti for example mwina akhoza kukhala kuti akudziwa, komano but now how do you know kuti akhoza kukaphunzitsadi bwinobwino do you have any*
Mr. Chipasula: *zoti akhoza kukaphunzitsa bwinobwinozo may be because of time chifukwa timangopangako sample, penapake ayeselerepo kufikila penanso ayeserelepo, kutengera kuti syllabus ndiyayitali ndiye kuti pali ponse ayesererekо kuchitani ndiye kuti siziyendanso (practice as a measure of being able to teach)*
Researcher: *ok so its like malo ambiri amakhala akuti if they know the stuff, then you assume*
Mr. Chipasula: *ehhe we assume they can teach (assumption is if they know the content then they will be able to teach)*
Researcher: *they can teach*
Mr. Chipasula: *chifukwa ife timangopangako sample penapake tayeserelani mmene mungapangire coz sometimes after a lesson, after a topic I mean we ask them to prepare a min lesson plan so that they can peer teach.*
Researcher: *and in all these lessons even in the other lessons I noted that like mukamawauza mwina zoti akupita like za methodology eti*

Mr. Chipasula: *yah*
Researcher: *you ask them kuti now how would you or discuss in your groups how you would I introduce this its like you like to use the word introduce*
Mr. Chipasula: *introduce instead of teaching*
Researcher: *yah laughing do you have any reason behind it why you would normally say introduce*
Mr. Chipasula: *ok I think its because I its I think to me the actual teaching is in introducing laughing*
Researcher: *so its like*
Mr. Chipasula: *and most of the times when you are introducing you use more activities instead of the other lesson which we can call practice lessons where by you just solve with pupils an example and you just say now can you try this.*
Researcher: *ok, now I get it, so you are saying when you say introduce its like you*
Mr. Chipasula: *you are teaching for the first time*
Researcher: *it's the first lesson of the topic*
T: ehe yes
Researcher: *owo, ok, I was wondering why does he like using the word introduce, ok so mumangopanga zapanga introduce koma kwinako*
Mr. Chipasula: *kwinako timadziwa kuti after that lesson kwambiri kumangokhala mwina kutenga exercise, or question imodzi ku solve ngati example kenako ananu tayeselani izi*
Researcher: ummho
Mr. Chipasula: *eya*
Researcher: *ok, I think now I understand, ok ndeno ummhu ok the other thing that I wanted to find out kuti if from these four lesson that we have observed did you find any language problem? Like yourself now, to your side anyway I think you can explain both sides to your side and for the side of the students any language challenges that you met*
Mr. Chipasula: *laughing yah, some like yesterday when we were multiplying fractions learner said ah no first of all we forget the decimal point, we ignore the decimal point ah but how we tell the learners in their local language, ah izi decimal point tingotaya, laughing ahh ndizoona tangotayadi laughing ok just imagine there is no decimal point, ah how can we say*
Researcher: *so akanenanso kuti tingotaya nanga akamutenganso kuti*
Mr. Chipasula: *akamutenganso kuti yah vuto limakhala ngati limanero*
Researcher: *kuti adzabwererenso*
Mr. Chipasula: *aha*
Researcher: *so how did you solve it*
Mr. Chipasula: *laughing we agreed that we say kukhalangati tamuyiwala kaye timuonanso kumapeto tikamaonanso kuti mu answeramu decimal akhala pati*
Researcher: *ok, anything else apart from that, on the issue of language*
Mr. Chipasula: *issue of language I think with this topic I didn't observe*
Researcher: *I don't know were discussing*
Mr. Chipasula: *on language*
Researcher: *on language eti*
Mr. Chipasula: *so during that topic language was not an issue it's a topic to be covered in standard five and we use English.*

Researcher: *owwo, ok*
Mr. Chipasula: *yah, ndiye sitinayinganizire kwambiri kuti mchichewa tingayiphunzitse bwanji*
Researcher: *ok*
Mr. Chipasula: *yah*
Researcher: *ndiye the other thing that I wanted ti find out is, do you foresee any language problems that these student teachers if they go ku kaphunzitsa ku*
Mr. Chipasula: *ma school mwawo*
Researcher: *ma school mwawo yah*
Mr. Chipasula: *yah, I think the problem that we have as mathematics teacher educatorss is that we only think of using English when teaching and so all our discussions are in English, and even like if you say can you please demonstrate how you can teach, sometimes we still emphasize that they should do it in English yet the lesson under discussion is going to be covered in lower classes where Chichewa will be used, so that is our main problem.*
Researcher: *so how do you address those type of problems,*
Mr. Chipasula: (*laughing) I think we have not yet found the solution to these problems, for example when they are preparing the schemes of work or lesson plans; Schemes of work is written in English, lesson plans is also written in English, teachers guide is in English but pupils book is written in Chichewa In that case I think in mathematics we still have a very big problem.*
Researcher: *ok so I just wanted to find out kuti when you you are preparing ngati lesson iyiyi ya madecimals anyway, do you consider ngati mwina mukamapanga prepare paja kuti kupanga consider kuti ngati awawa ma decimals kuti akamukaphunzitsa this topic, what, what are possible issues what are the possible difficulties and then you plan kuti ok how can I handle this so that mukamapita ku class kuja you at least know something kuti kuti you know kuti I have to address this problem, I have to address this problem*
Mr. Chipasula: *yah sometimes tikaunikila tikayiona kuti vuto limenelolo likhalapo timatha kukonzekera bwinobwino kuti ah I think ma students akakhala ndi vuto lakuti tikalipanga bwanji akakhala topic yoti akaphunzitsidwa standard one to four apa mwina akakhala ndi vuto lala language akalipanga bwanji apapa akakhala ndi vuto loti mwina kathuka sanakaoneponse for example we are talking of may be pre number activities where there is sorting ndiye akangowapatsa kuti tapangani sort kuti ah kwayiowo sakumbukila thawi yathu ija tikalowa mu class standard one timangoyambira ma number enieni pamene panapo timayambirabe ti ma pre number activities chain ndiye thawi zina timakonzekerabe kuti ah popeza sakulidziwa ndikafotokozebe kufika apa, apa akayesere*
Researcher: *ok, its like, I think the other thing that I wanted to find out is like in your presentations you teach ngati mmene ndinafotokozera poyamba paja kuti you consider them like kuti ndima primary pupils eti*
Mr. Chipasula: *yah*
Researcher: *do you have any intentions onena kuti like you act as a mentor kunena kuti, the way am doing it*
Mr. Chipasula: *ndimenenso azikapangira iwowow ya sometimes ikakhala kuti mwina ndi actual teaching yak u primary school ija timafuna chocho penapake kuti at*

least azikapanga follow zimene zozo, mchifukwa chakenso ngati room imene ijayo panali issue ya ujeni, ya dressing the room, laughing, kufuna zithu ngati materials ajawo iwowo azikapanga produce materialrs ajawo oti thawi zina tikati ichi tikhoza ku user place value box timafuna timatha kenena kuti gulu lilironse likapange produce place value box

Researcher: *ok, so in that case we can also say, can we say kuti in the same language eti, in the way you produce your words the way you communicate, the use of gestures or using whatever or anything eti chimene we can use for communication, can we say kutinso do you encourage them to observe you instead of just the way you are talking*

Mr. Chipasula: *laughing, not really, kwinako sitimachita kupanga emphasize kuti mundiwone ndikupangiramu muzikapanga chonchi ayi .*

Researcher: *its just they know themselves*

Mr. Chipasula: *ehe*

Researcher: *ok, this is how we should do it*

Mr. Chipasula: *yah*

Researcher: *now I was interested to see kuti ngati in most cases panali malo ena oti kwina you say how would you introduce this, koma panali malo ena oti you couldn't say anything of that sort eti its like kuti ma students aja akupanga lead okha kuti*

Mr. Chipasula: *apa tipange chonchi, apa tipange chonchi*

Researcher: *ehe, ndiye I was just interested to know kuti is there any way, is there anything chimene chimawapangitsa ma studentswo kuti awone mene amphunzitsi akupangiramu ndimmene akufuna kuti ife tizikapangira in the absence of words like how would you introduce, how would you do this, how would you do that, in the absence of those words what is it that makes students to see kuti mmene akupangira aphunzitsimu akutiuza kuti kuphunzitsa timapanga chonchi*

Mr. Chipasula: *laughing just solve this one and we are revising it, we say no, no, no apa mukhonza kusokoneza ana, so tikapanga choncho I think kumakhala kuwauza kuti apapa musakapange choncho ana sangamvetsetse or they can be confused*

Researcher: *so its like there is always a clue*

Mr. Chipasula: *yah sometimes, not always laughing*

Researcher: *ok there is sometimes a clue yoti they read eti kunena kuti, just one word kuti apapo*

Mr. Chipasula: *apapo mwina mwake ikhale ngati tikufotokozera mwana*

Researcher: *ok and then, I just wanted to find out your feelings now that after like teaching this topic ya ma decimals how do you feel kuti on the side of the students that they are now well prepared they can go into the field to teach the topic*

Mr. Chipasula: *yah, I feel because within the four or five lessons I think we have tackled important issues may be from standard five up to std eight, so that's why it is sometimes difficult to emphasize always to say how can we teach, how can we teach that's why we just sample, I think we have sampled enough*

Researcher: *ok and do you feel anything kuonapo china chake kunena kuti choti it has helped them to develop their language. On this issue now topic ya ma decimals eh and language yake, when I say language in this sense am talking of not kuti Chichewa or English, koma kuti ngati this topic eti ndiyoti akaphunzitsa me English through out anything that you have seen that it has contributed to say their language or it has developed their language somehow osati mwina kupangiratu*

Mr. Chipasula: *I think mmene timapangiramu kutenga ka concept pang'ono kuyiyeselera, kuyifotokoza using the place value chart or you can use place value box with chart I think ndimene timafotokozera ndiye kuti mwina communication ku language zikagwira bwino bwino akakapita ku school.*
Researcher: *so apart from say zithu zopanga prepare how else do you asses these kuti I think my objectives have been achieved*
Mr. Chipasula: *yah, using group work sometimes Its difficult to check objectives that's why may be we move around to see how they are participating, to encourage each one to participate yah when two or three groups, when they are presenting, say the first group has presented you ask another group they will say it's the same procedure sometimes they can cheat laughing so sometimes some of us we used to say, may be to have columns and I call each member from the six groups say now write whatever you have so that we but the only worry is sometimes is time consuming laughing*
Researcher: ok and then do you feel kuti, mwina pali china chake, mwina after lesson yoyamba ija kaya yachiwiriyi eti after kuti tamaliza, mwina you had may be something kuti lesson ija mwina ndikanapanga zakuti mwina zikanandithandiza anything of that sort or the other way could be kodi lesson inayenda mmene munapangira plan or something made you to change
Mr. Chipasula: *sometimes ma … addition and subtraction kumapeto kwina kwake ndi ma discussions inadzakhala ngati thawi yatha ndiye malo moti wapanga plan kuti akambiranabe mmagru sometimes you just use class discussions apa titani, apa titani apa titani and the last topic on my plan I wanted to combine multiplication and division to be one period it has dragged the time you say may be now we can start division it was already one hour gone so*
Researcher: *ok*
Mr. Chipasula: *but I think its because of the syllabus, our syllabus is bulk so with the type of the methods they are encouraging*
Researcher: *zimakhala ngati thawi ndiyo chepa, ok*
Mr. Chipasula: *yah because topic iyiyo mu syllabus inayipatsa kaya ndi two hours kaya ndi three hours*
Researcher: *yah ma decimals*
Mr. Chipasula: *eeh*
Researcher: *owo ok*
Mr. Chipasula: *so kuona kuti zimene anayikamo mu syllabus muli zithu zambiri*
Researcher: *ok ah like is lesson three you were emphasizing on the use of really life situations to explain the addition and subtraction of decimals ndiyeno I was just interested to know why did you emphasize on really life situations*
Mr. Chipasula: *as I said when we say introduce we need activities yah, now we talk of decimals, ma activities a ma decimal ambiri imasowa kuti activity yake ingakhale yotani so that's why thawi zambiri timawafunsa dala zithu ngati zimene zijazo kuti ngakhale akuphunzitsa topi yowoneka more abstract akhozabe kupeza china chake choti anabe akhoza kupanga*
Researcher: *kupanga*
Mr. Chipasula: *that's why when they were saying measuring inde a measure ma decimals komano emphasis ikhala pa ma units ake, kuti apa tapeza bwanji, apa tapeza bwanji, apa*

Researcher: *so its like to encourage them anganize kuti how can I introduce the decimals*
Mr. Chipasula: *eya*
Researcher: *ok, because I was thinking kuti why not using say kuti ngati mwina kungowafotokozera using number line or whatever, may be I can ask you of anything that you noted that I didn't take note of, like, may be you think panali issue iyi, or issue iyi*
Mr. Chipasula: *zambiri ndikuona ngati kuti mwazipanga capture ndithu*

APPENDIX D: PERMISSION LETTERS

TO: THE PRINCIPAL.

FROM: Nancy Chitera (Mrs) – The University of Witwatersrand

SUBJECT: **INVITATION TO PARTICIPATE IN MATHEMATICS EDUCATION RESEARCH PROJECT**

My name is Nancy Chitera (Mrs). I am a mathematics teacher educators at the University of Malawi and currently doing PhD degree in Mathematics Education with the University of Witwatersrand in South Africa. As part of my studies, I am doing a research investigating language practices of mathematics teacher educators in teacher training colleges. I am thus, sending you this letter to invite your College to participate in this research project. Once you have read the letter you can decide whether you want the College to take part or not.

The Ministry of Education has given me permission to send you this letter to invite your College to participate in this research project. Your College has been chosen purposefully, because the dominant language in the region where your TTC is located is different from the dominant languages in other regions. The assumption is that because of the differences in the dominant languages, then your Colleges' participation will give a variety of language practices which may not be the same as in other Colleges.

If you agree that your College should participate then I would request the involvement of three mathematics mathematics teacher educatorss who teach mathematics to the first years together with their students. The mathematics teacher educatorss will be chosen on the basis that they one of the experience mathematics teacher educatorss in mathematics teaching and hold high qualifications in the field. These mathematics teacher educatorss will be asked to participate in pre-observations interviews, reflective interviews and will be observed teaching mathematics for five consecutive days per term for two terms. Thereafter they will be asked to participate in focus group discussions after all the observations are done. The dates for the observations will be negotiated with the mathematics mathematics teacher educatorss. I would also request the involvement of some selected mathematics students for focus group discussions after the lesson observations for the first two terms. With your permission, the lessons will be video-recorded and the interviews tape-recorded so that I can ensure an accurate record of what mathematics mathematics teacher educatorss and student teachers will say and do. When the tape has been transcribed, you will be provided with a copy of the transcript.

I intend to protect anonymity of your college, students and mathematics teacher educatorss to the fullest possible extent. The college name and contact details will be kept in a separate file from any data that you supply. This will only be able to be linked to data from your College by me. In any publication emerging from this research, the school and participants will be referred to by a pseudonym. I will remove any references to personal information that might allow someone to guess the identity of the participants and the College; however, you should note that as the number of Colleges

involved in the research is very small it is possible that someone will still be able to identify the College. In case any information collected through video recording is used for conferences, participants' faces will be hidden.

A brief summary of the findings will be available to you once the research has been completed.

Please note that your College is not forced to participate in this research project. Your decision to participate or not, or to withdraw, will be completely independent of your dealings with the University of the Witwatersrand and the University of Malawi. Should you wish to withdraw at any stage, or withdraw any unprocessed data collected in your school, you are free to do so without prejudice.

For further information do not hesitate to contact me – my address and telephone numbers are below.

Nancy Chitera (Mrs)

The Polytechnic, P/Bag 303, Chichiri – Blantyre 3.

Tel 01 670 411; Cell 08 896 128

TO: THE MATHEMATICS TEACHER EDUCATORS

FROM: Nancy Chitera (Mrs) – The University of Witwatersrand

SUBJECT: **INVITATION TO PARTICIPATE IN MATHEMATICS EDUCATION RESEARCH PROJECT**

My name is Nancy Chitera (Mrs). I am a mathematics mathematics teacher educators at the University of Malawi and currently doing PhD degree in Mathematics Education with the University of Witwatersrand. As part of my studies I am doing a research to investigate language practices of mathematics teacher educators in Teachers' Training Colleges (TTCs).

Your Principal has given me permission to send you this letter to invite you to participate in this research project. You have been chosen on the basis that you are one of the most experienced mathematics teacher educatorss in mathematics teaching and that you have high qualifications in this field. Once you have read this letter you can decide whether you want to take part or not. If you agree to participate, I will ask you to contribute in four ways:

1. First, I would ask you to participate in a pre-observation interview which will be done a day before the lesson observation for at least one hour.
2. Second, allow me to observe your teaching in one of your mathematics lessons for a week per term for two terms.
3. Third, I would ask you to participate in reflective interviews immediately after lesson observation
4. Lastly, I would like you to participate in focus group discussions after all the observations are done.

The dates for all of this will be negotiated with you.

With your permission, the lessons will be video-recorded and the interviews tape-recorded to ensure an accurate record of what you and the student teachers will say and do. When the tape has been transcribed, you will be provided with a copy of the transcript, so that you can verify that information is correct.

I intend to protect your anonymity and confidentiality of your responses to the fullest possible. Your name and contact details will be kept in a separate file from any data that will be collected and will be linked to your data by me only. In any publication arising from the results of this research, you will be refereed to by a pseudonym. References to personal information that might allow someone to guess your identity will be removed.

The results of this research may be presented at academic conferences, and published in national and international journals and to research funders. In case any information collected through video recording is used for conferences, permission will be requested from you before it is used and your faces will be hidden from public viewing.

A brief summary of the findings will be available to you once the research has been completed.

Please note that you are not forced to participate in this research project. Your decision to participate or not, or to withdraw, will be completely independent of your dealings with the University of the Witwatersrand and the University of Malawi. Should you wish to withdraw at any stage, or any unprocessed data collected in your school, you are free to do so without prejudice.

If you would like to participate, please indicate that you have read and understood this information by signing the accompanying consent forms and returning them to me.

For further information do not hesitate to contact me – my address and telephone numbers are below.

Nancy Chitera (Mrs)

The Polytechnic, P/Bag 303, Chichiri – Blantyre 3.

Tel: 01 670 411; Cell 08 896 128

UNIVERSITY OF THE WITWATERSRAND: MATHEMATICS RESEARCH PROJECT

Dear Student

My name is Nancy Chitera (Mrs). I am a mathematics mathematics teacher educators at the University of Malawi and currently doing PhD degree in Mathematics Education with the University of Witwatersrand in South Africa. As part of my studies I am doing a research investigating language practices of mathematics teacher educators in Teachers Training Colleges (TTCs).

Your Principal and mathematics mathematics teacher educators has given me permission to send you this letter to invite you to participate in this research project. Once you have read this letter you can decide whether you want to take part or not. If you agree to participate in this research project you and all the other students in your class will be asked to be present during the mathematics lecture when I will be visiting your class to video-record the lectures. The observations will be done for five consecutive days for two terms. The dates for all this will be negotiated with your mathematics teacher educators and s/he will let you know. There is also a possibility that you might be selected by your mathematics teacher educators to participate in a focus group discussions. This discussion will last for not more than one hour and will focus on the lectures I will observe. With your permission, lectures will be video-recorded and interviews will be tape recorded to ensure an accurate record of what you do and say. If you are selected for the interview, you will not be forced to answer any questions. If you do not know the answer to a question that is being asked you will not be penalized. The answers that you give to the questions will only be seen by me and my supervisor. So please do not worry that your mathematics teacher educators might look at them. The research has nothing to do with your College report or marks that you get for mathematics.

I intend to protect your anonymity and the confidentiality of your responses. Your name and contact details will be kept in a separate file from any data that you supply and will be linked to your data by me only. In any publication emerging from this research, you will be referred to by a pseudonym. References to personal information that might allow someone to guess your identity will be removed.

The results of this research may be reported at academic conferences, and published in national and international journals and to research funders. In case any information collected through video recording is used for conferences, your faces will be hidden from public viewing. Permission will be requested from you before it is used for conferences.

Please note that you are not forced to participate in this research project. Your decision to participate or not, or to withdraw, will be completely independent of your dealings with the University of the Witwatersrand and the University of Malawi. Should you wish to withdraw at any stage, or withdraw any unprocessed data collected in your school, you are free to do so without prejudice.

If you would like to participate, please indicate that you have read and understood this information by signing the accompanying consent forms and returning them to me.

For further information do not hesitate to contact me – my address and telephone numbers are below.

Nancy Chitera (Mrs)

The Polytechnic, P/Bag 303, Chichiri – Blantyre 3.

Tel 01 670 411; Cell 08 896 128

LEARNER CONSENT FORM: Videotaping

I …….. (please print your name in full) a mathematics student teacher at ……., am aware of all the data collection processes in this study as listed in the information sheet attached.

I give consent to the following:

- Being videotaped during mathematics lesson.

  Yes ☐ No ☐

  (use a cross to indicate your selection)

- The possible future use of videotext for conference purposes

  Yes ☐ No ☐

  (use a cross to indicate your selection)

Signed …….. Date …….

LEARNER CONSENT FORM: Tape-recording

I …….. (please print your name in full) a mathematics student teacher at ……., am aware of all the data collection processes in this study as listed in the information sheet attached.

I give consent to the following:

- Being interviewed at some point during the study.

  Yes ☐ No ☐

  (use a cross to indicate your selection)

- The tape recording of my interview with the researcher.

  Yes ☐ No ☐

  (use a cross to indicate your selection)

Signed …….. Date …….

TEACHER CONSENT FORM: Videotaping

I …….. (please print your name in full) a mathematics teacher educator at ……., am aware of all the data collection processes in this study as listed in the information sheet attached.

I give consent to the following:

- Being videotaped during mathematics lesson.

  Yes ☐ No ☐

  (use a cross to indicate your selection)

- The possible future use of videotext for conference purposes

  Yes ☐ No ☐

  (use a cross to indicate your selection)

Signed …….. Date …….

TEACHER CONSENT FORM: Tape-recording

I …….. (Please print your name in full) a mathematics teacher educator at ……, am aware of all the data collection processes in this study as listed in the information sheet attached.

I give consent to the following:

- Being interviewed at some point during the study.

  Yes ☐ No ☐

  (use a cross to indicate your selection)

- The tape recording of my interview with the researcher.

  Yes ☐ No ☐

  (use a cross to indicate your selection)

Signed …….. Date …….

TO: THE PRINCIPAL SECRETARY – MINISTRY OF EDUCATION.

FROM: Nancy Chitera (Mrs) – The University of Witwatersrand

DATE: September, 2006

SUBJECT: **PERMISSION TO INVITE TTCs TO PARTICIPATE IN MATHEMATICS EDUCATION RESEARCH PROJECT**

My name is Nancy Chitera (Mrs). I am a mathematics mathematics teacher educators at the University of Malawi and currently doing PhD degree in Mathematics Education with the University of Witwatersrand in South Africa. As part of my studies I am doing a research investigating the language practices of the mathematics teacher educators in Teachers Training Colleges (TTCs). I am thus sending you this letter to seek permission to invite TTCs to participate in this research project. Once you have read this letter you can decide whether you want the TTCs to take part or not.

If you agree that the Colleges should participate then I would request the involvement of two TTCs that will be selected purposefully in the different regions of Malawi. In each College, I would request the involvement of three mathematics mathematics teacher educatorss together with their first year students. The mathematics teacher educatorss will be selected on the basis that, they are the most experienced and hold high qualifications in mathematics and teach the first years. These mathematics teacher educatorss will be asked to participate in pre-observation interviews, reflective interviews and be observed teaching mathematics for five consecutive days per term for the first two terms and then participate in focus group discussions after all the observations are done. The dates for the observations will be negotiated with mathematics mathematics teacher educatorss. I would also request the involvement of some selected mathematics student teachers for focus group discussions after the lesson observations for the first two terms. With your permission, the lessons will be video-recorded and interviews tape-recorded to ensure an accurate record of what mathematics mathematics teacher educatorss and student teachers will say and do. When the tape has been transcribed, you will be provided with a copy of the transcript.

I intend to protect anonymity of the Colleges involved, students and mathematics teacher educatorss to the fullest possible extent. The College name and contact details will be kept in a separate file from any data that will be supplied. This will only be able to be linked to data from the College by me. In any publication emerging from this research, the school and participants will be referred to by a pseudonym. I will remove any references to personal information that might allow someone to guess the identity of the participants and the College In case any information collected through video recording is used for conferences, participants' faces will be hidden.

A brief summary of the findings will be available to you once the research has been completed.

Please note that the Colleges' participation in this research project is voluntary. Your decision to allow the Colleges to participate or not, or to withdraw, will be completely independent of your dealings with the University of the Witwatersrand and the

University of Malawi. Should you wish to withdraw at any stage, or withdraw any unprocessed data collected in the TTC's, you are free to do so without prejudice.

For further information do not hesitate to contact me – my address and telephone numbers are below.

Nancy Chitera (Mrs)

The University of Witwatersrand, Wits School of Education, P/Bag 3, Wits, Johannesburg, 2050 SA.

Cell (+27) 76 766 2142

Email: nchitera@yahoo.com

5th October 2006 **DTED: TRP/VOL.06/19**

FROM: THE ACTING DIRECTOR, DEPARTMENT OF TEACHER EDUCATION AND DEVELOPMENT, P/B 215, LILONGWE.

TO: NANCY CHITERA (Mrs), THE UNIVERSITY OF WITWATERSRAND, WITS SCHOOL, P/B 3, JOHANNESBURG. 2050 SA

SUBJECT: **APPROVAL TO USE TTCs TO PARTICIPATE IN MATHEMATICS EDUCATION RESEARCH PROJECT**

Following the directive this office got from the DDSE of the Ministry of Education and Vocational Training, dated 05/10/06, permission has been granted that you work with our Teacher Training Colleges in the research project.

You may wish to be told that choice of college you can work with is entirely yours. But for clarity purposes; we have five Teacher Training Colleges in Malawi: Blantyre TTC, P/B 502, Limbe. (Principal, Sr. E.M. Kantunda Cel.08 654 607), St. Joseph's TTC, P.O.Box 11, Dedza. (Deputy Principal, Mr. S.P. Kapachika, Cel;09 947 504). Lilongwe TTC, P.O.Box 40046, Kanengo, Lilongwe 4. (Principal Mr. E.S Kapalamula Cel. 09 201 080). Kasungu TTC, P/B 23, Kasungu. (Principal Mr. M.H.M. Magelegele Cel. 08 864 627), Karonga TTC, P.O.Box 133, Karonga. (Principal Mr CBR Lupafya Cel. 08 325 855).

Further information is that St. Joseph's is an all ladies college, while the rest are co-educational. You may make contacts with the college management to give you names of Maths Mathematics teacher educators and the number you require and tell them your criteria for their choice. Once that is done you will communicate with us.

Yours Faithfully,

Patrick Themu

for**: Ag. Director- DTED.**

APPENDIX E: EXAMPLE OF LINGUISTIC ANALYSIS OF THE DATA

LINGUISTIC ANALYSIS OF THE MATHEMATICS TEACHER EDUCATORS							
The text	**Pronouns**	**Identity being referred to**	**Characterization of identity**	**Activity**	**Turn-taking**	**Mood**	**Sequencing of Information**
lets continue from where we stopped (*putting a chart on the chalk board*) that's ah, skills, that is three or four skills,	We (Inclusive)			Stating the objectives of the lessson		statement	
the first one is going to be changing mixed numbers to improper fractions,				Stating the first objective of the lessson		statement	First one
that is we have to change these numbers to improper fractions, which are similar or the same denominators,	We (*Inclusive*)			Rephrasing what he read from the chalk board	Teacher educator	statement	
then addition of proper fractions with different denominators,				Stating the second objective of the lessson	Teacher educator	statement	then
we will start with changing mixed numbers to improper fractions.	We (*Inclusive*)			Stating what they will start with	Teacher educator	statement	
Ah consider the mixed number two, four fifth,				(*reading from the chart*),	Teacher educator	statement	
ah the activity says, let's use a number line, let's use a	We (*Inclusive*), Us (*Inclusive*)			Rephrasing the given	Teacher educator	statement	

number line, to show that, two four fifth is equal to two plus four fifth, now two plus four fifth, we are doing that activity together as a class …				problem			
any volunteer, show that two four fifth is equal to two plus four fifth (*while pointing to the chart using the chalk board ruler*), using a number line,				Inviting the students to answer the question	Teacher educator	question	
Yes				Choosing a student to respond the question	Teacher educator		
(*drawing the number line on the chalk board using the ruler, dividing it into two equal pars, then divide the distance between zero and one into five parts the same with the distance between one and two but failed to label the parts*)				Writing on the chalk board	Student teacher		
Yes				Pointing at another student	Teacher educator		
from here to here is one, suvh that these are small parts, small ones which are forming one, so two here and here, so from here to here, its one and from				(*rubbed the number line by the first and drew his and divided*	Student teacher		

here, here, here, ….				*into three then each part divided into five sections*),			
Laughing					Student teachers		
from here to here we have formed five parts (*referring to between two and three*) but the question says four over five, so count from here, one, two, three, four, so this point here is giving us two, four over five.	We (*Inclusive*)			Answering question	Student teacher		
any different view (*silence*), anyway he is correct three are about five subdivisions between zero and one,	He (referencing)			Evaluating the students answer	Teacher educator	statement	
similarly there are five subdivisions between one and two, and five subdivisions between two and three, now since we have a total number of five, then the first one must represent the fraction of one! Fifth, the next one, two fifth, three fifth, four fifth because the distance from this, this one and this one is only one similarly between two and three its what	We (*Inclusive*)			Telling and demonstrating	Teacher educator	statement	Then

One				Answering question	Student teachers		
therefore our case is two four fifth, show that two four fifth is equal to two plus four over five,				Reading from the chart	Teacher educator	statement	Therefore
so this is our two and there we label ah this point as four fifth that is if we are considering points ah between two and three,	Our, we (*inclusive;*)	Teachers	Mathematics teachers	Telling and demonstrating	Teacher educator	statement	
therefore this two plus all these up to this point is just the same as, what is given as two four fifth,				Telling and demonstrating	Teacher educator	statement	Therefore
that's the way to use a number line to show that two four fifth is equal to two plus four fifth,				Concluding remarks	Teacher educator	statement	
now next statement says, change the whole number two to a fraction with denominator five				Reading from the chart	Teacher educator	statement	Next
why should we change the whole number two, that's this number to a fraction, or equivalent fraction with denominator five, why should we change that, why, change the whole number two referring to this two, to a	We (*Inclusive*)			Posing a question	Teacher educator	question	

fraction with denominator five, why should we use a denominator five and not any other denominators in this case,							
Yes				Pointing at a student to answer question	Teacher educator		
because there are five subdivisions up to one				answering question	Student teacher		
five subdivisions making one, not really				Repeating the students answer	Teacher educator	Statement	
of course he is correct	He (*referencing*)	Student teacher	student	Evaluation of the students answer	Teacher educator	statement	
but actually we are looking at the denominator of this fraction, the denominator of this fraction is five and therefore we need to come up with an equivalent fraction of two with a denominator of five, and this is ten over what! Five,	We (*Inclusive*)	Teacher educator and student teachers	Teachers	Telling students the procedure	Teacher educator	statement	Therefore
what has happened to change two to ten over five, how have we changed two to ten over five,	We (*Inclusive*)	Teacher educator and student teachers			Teacher educator	question	

Yes				*pointing at a student* to answer question	Teacher educator		
may be we have multiplied two by the denominator five	We (*Inclusive*)	Teacher educator and student teachers			Student teacher		
two by the denominator five				Repeating the students answer	Teacher educator		
Yes				*pointing at a student* to answer question	Teacher educator		
I think we have multiplied two by five subdivisions	We	Teacher educator and student teachers		-answering a question	Student teachers		
no, what we have done there is, its, actually two over one (*writes*), eh so we want to change this one to an equivalent fraction but that fraction must have a denominator of five ,	We (*Inclusive; invitation*)	Mathematics teachers	Inviting students to the profession	demonstration	Teacher educator	statement	
so we have to multiply the numerator and denominator by five, so we have to multiply the numerator and denominator	We (*Inclusive; invitation*)	Mathematics teachers		-Writing the steps involved as he is talking	Teacher educator	statement	When we do that

by this five, when we do that (*writing steps involved*), when we do that we get ten over five,				-asking and answering himself			
so next replace two with ten over five because these are simply equivalent fractions, so replace two with ten over five in two plus four over five, that is this one and end up with ten over five plus four over five,		Student teachers (what they are expected to do)	Future teachers do not know what they are expected to do		Teacher educator	Statement	Next, end up with
and then since ah, denominator is the same *we* end up with ten plus four over five, which is fourteen over five,	We				Teacher educator	Statement	Then
anyway that is one way of changing numbers, changing mixed numbers to improper fractions,				Concluding remarks	Teacher educator	Statement	
however there is a shorter way of doing that, all you are supposed to do with your pupils, is	You, your	Student teachers	Future teachers do not know what they are expected to do	Telling students what they are supposed to do	Teacher educator	Statement	
you multiply the whole number with the denominator the product that you find must be added to the denominator and the denominator is going	you	Student teachers	Future teachers	Telling students what they are supposed to do	Teacher educator		

to be maintained, so have something like five times ten							
Ten				Answering question	Student teachers		
ten, and then ten plus what?				Questioning	Teacher educator	Question	Then
Four				Answering question	Student teachers		
four over				Invitation	Teacher educator	Statement with high pitch (*question*)	
Five					Student teachers		
you simply get something like fourteen over five	You (*othering*)	Student teachers		Concluding remarks	Teacher Educator	Statement	
addition of proper fractions whose denominators are the same,				Reading from the chart	Teacher Educator	statement	
consider the following addition problem				Reading from the chart	Teacher Educator	statement	
that is one plus one over five plus three over five				Reading from the chart	Teacher Educator		
model the addition process as follows,				Instruction	Teacher Educator	command	
that is to say when we are trying to teach addition of fractions, we normally start	We (exclusive/ invitation)	Mathematics teacher educators/	Experienced / Experts	Telling what teachers that are	Teacher Educator	Statement	

with simpler things which pupils can appreciate, that is, they can easily see		Experienced teachers		experienced do when teaching			
that is why there is need for us to model the addition of these fractions,	Us (*exclusive/invitation*)	Mathematics teacher educators/ Experienced teachers	Experienced / Experts		Teacher Educator		
and to do that we are going to use a rectangle with eh some subdivisions	We (*Inclusive: as teachers*)			Telling students the procedure	Teacher Educator		
and for this sum of one over five plus three over five,				Reading from the chart	Teacher Educator	Statement	
first of all there is need for us to model the addition process as follows,	Us (*Inclusive*)			Instruction	Teacher Educator	Statement	First of all
draw a rectangle as I have done this one (*pointing to the rectangle*),	I ()			Doing /Instruction	Teacher Educator	command	
it has to be a rectangle or a circle,				Instruction	Teacher Educator	command	
divide that rectangle into ah five equal parts as shown below,				Instruction	Teacher Educator	command	
by dividing this rectangle into five equal parts, because of the denomianator, that we are using in this addition	We (*Inclusive*)			Explaining why	Teacher Educator	Statement	
then model the fractions one fifth and three fifth				Doing /instruction	Teacher Educator	command	Then

how have we modeled the fractions in this case,	We (*Inclusive*)			Inviting the students	Teacher Educator	question	
I have modeled one fifth by shading this different from ah three fifth which is these three parts and then out of the five parts, one part has been modeled as one fifth, which is this one, three parts has been modeled which represent that fraction (*pointing to three fifth*)	I (*referecing: showing what he has done*)			Telling the students what he has done	Teacher Educator	statement	Then (to show the sequencing)
and then when we add the total number of parts which have been shaded we end up with one, two, three four out of how many parts!	We (*Inclusive as teachers)*			Invitation (using high pitch)	Teacher Educator	Statement, question (indicated with a high pitch)	
Five					Student teachers		
five, so that's the way we can model the addition of fractions whose denominators are the same	We (*Inclusive as teachers)*			"That's the way": concluding remarks	Teacher Educator		
, however looking at the denominator a common the same denominator for the two fractions, there is one simple way of adding fractions,				Telling students of an alternative method	Teacher Educator	Statement	

who can guess, who knows,				Asking students to “guess”	Teacher Educator	question	
instead of going through this process of modeling addition of fractions, what’s the simplest way of adding these fractions				Asking students to “guess”		question	
, yes				Choosing the student	Teacher Educator		