

**THE EFFECT OF LANGUAGE IN TEACHING AND LEARNING PRIMARY
SCHOOL MATHEMATICS**

MASTER OF EDUCATION (PRIMARY) THESIS

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DECLARATION

I, the undersigned hereby declare that this thesis is my own original work which has not been submitted at any other institution for similar purposes. Where other people's work has been used acknowledgements have been made.

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DEDICATION

To my beautiful wife Fiskani, the angel of my life and the engineer of my prosperity for twenty six years now.

To my last born son, Nebbu (Jn) who was left at home in the hands of housekeepers during my two year studies at Chancellor College, University of Malawi.

To my late father, Mr. Overton Chizwazwa Chimaliro and my late sisters, Damaless and Leah. May their souls rest in internal peace.

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ABSTRACT

For over twenty years now, there has been persistent outcry from the general public, parents and teachers that the performance in mathematics is low in primary schools. Language of learning and teaching (LOLT) mathematics has been pointed out as one of the factors that affect learners understanding of mathematics especially in classes where English as a second language is used. Therefore this study aimed at finding out the effect of language of instruction in learners understanding of mathematics especially those involving word problems in standard 5. The study used qualitative approach. The sample consisted of one hundred and thirteen learners and two mathematics teachers selected from two primary schools. Four data collection techniques were used. The data collected were analysed using qualitative data analysis techniques. The study later found out that English supplemented with Chitumbuka was used to a larger extent as a language of learning and teaching in standard 5 during mathematics lessons. The findings of the study also revealed that using English as a language of instruction when teaching and learning mathematics in standard 5 resulted into a number of common language problems, misconception and errors. Hence the study established a number of strategies that both teachers and learners used or would want to use in order to overcoming problems. From these findings it was concluded that the language of learning and teaching mathematics in primary school has an effect on learners understanding of mathematics especially those involving use of word problems.

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ABBREVIATIONS

DEM	:	District Education Manager
LOLT	:	Language of Learning and Teaching
MANEB	:	Malawi National Examination Board
MoEST	:	Ministry of Education Science & Technology
NAEP	:	National Assessment of Education Progress
PEA	:	Primary Education Advisor
TTC	:	Teacher Training College

CHAPTER 1

INTRODUCTION

1.0 Chapter overview

This part has five main subsections. The first one is the background to the study which begins with the chains of reasoning developed for the study and leads us into specific questions to be answered. It has also a brief historical background leading to present status of the identified knowledge gap of this study. The next one is the statement of the problem which focuses much on the specific areas of concern in this study. This is followed by the theoretical framework that is the theory which guided the interest of this study. This is later followed by the purpose of the study, research questions, significance of the study, definition of key terms and finally this section closes with the organization of the thesis.

1.1 Background to the Study

The idea of language of teaching and learning (LOLT) in Mathematics is an old argument in Malawi. It dates back to the colonial period when four native languages Chitumbuka, Chiyao, Chinkhonde and Chinyanja were offered in the education system (Thodi, 2010). At independence in 1964, Malawi inherited a language policy in education in which Chichewa, Chitumbuka and English were recognized as medium of instruction in primary schools (Kishindo, 1994). This meant that mathematics too was taught in first languages from standard 1 to 4 and in English from standard 5 to 8. From that time several studies

have been conducted on the use of first language in teaching and learning mathematics in lower primary school but it seems very few studies have been conducted to look at the effects of using English as a language of learning and teaching (LOLT) on learners' conceptual understanding of word problems activities especially in standard five where learners start using English as a language of learning and teaching in mathematics. A study conducted by Kachaso (1988) on the effect of language on learners' achievement in mathematics word problems in standard 7 indicated that learners instructed in Chichewa scored significantly higher than those instructed in English on measures of ability to understand word problems in mathematics. This study mainly focused on performance of learners on word problems in English as well as in Chichewa.

In March, 1996, a shift to the language of instruction policy was later experienced in Malawi soon after multiparty democracy when a new language policy directive in primary school education was instituted by the government that assumed power in 1994 (MoEST, 1996). The policy directives stipulated that from then onwards, learners in the first four years of primary education would be taught in their mother tongue which meant that local native languages would be used as languages of instruction in primary schools (MoEST, 1996). "Native language is used to mean the language one is identified with or the language one knows best and uses most." (Mjaya, 2010:11). This simply meant that English would be a language of teaching and learning mathematics as well from standard five onwards. The policy directive triggered a heated debate among various stakeholders but not much was done in terms of research on learners' understanding of mathematics especially those involving word problems in standard five.

Studies that were conducted mainly looked at the effect of language of teaching and learning Mathematics in lower primary school such as by Kaphesi (1999) in standard 1- 4 Mathematics, Mchazime and Tiede (2003) conducted an experimental study in lower primary schools in Rumphu and Mangochi. Recently, Chauma (2013) conducted a study on the use of first language, Chitumbuka as a language of instruction in mathematics from standard 1 to standard 4 and the challenges faced by teachers who teach mathematics in the lower primary school. All these studies found out that most learners perform very well when instructions were in the learner's first language such as Chitumbuka and that very few misconceptions and errors were observed. It seems there has been no detailed study to look at the effect of language as a result of the change of language of instruction in standard five in connection to mathematics.

It is therefore important to examine the extent to which change of language of instruction this time from Chitumbuka to English immediately contributes to learners' understanding of mathematics especially those involving word problems in standard five. Word problems in mathematics have a number of word sentences which is a good testing ground for learners' understanding of mathematics concepts that are expressed in English.

1.2 Statement of the Problem

In fact there has been an outcry by many primary school teachers as well as parents about poor performance in mathematics that involves use of word problems activities in standard 5 for a number of years. Again from my knowledge as a former primary school teacher, it seems no systematic and proper follow up has been taken with a view to examine the misconceptions and errors that learners make in mathematics in standard 5 as a result of a switch from using first language, Chitumbuka to English as language of learning and teaching (LOLT). Furthermore, various studies have shown that despite mastering basic mathematics principles, techniques and processes, primary school learners still have difficulties in applying these techniques and processes to solve word problems especially in English (Jonassen, 2004). Orton (2006) contends that many teachers around the world express great concern about the difficulties which their learners express with word problems especially in the second language such as English. Many learners do not see the applicability of their formal mathematical knowledge to real world situations and they have only a weak understanding of arithmetic applications as models of situations (Orton, 2006). Studies have further indicated that learners seem to dislike mathematics in general and word problems in particular (p. 172). This is a cause of great concern in situations where English is not only children's second language but also the language used in mathematics lessons (Orton and Frobisher, 2005). The difficulties which most children experience with word problems are largely related to language of instruction (Orton, 2006). Other studies conducted outside Malawi have also clearly demonstrated that for learners learning mathematics in second language, English the evidence available to date suggests that children perform better when the problems are

translated into their first languages. Similarly several studies have also indicated that errors and misconceptions might arise at any stage of transition from one language of learning and teaching to another (Orton and Frobisher, 2005).

This study is therefore an attempt toward addressing this gap since there is great need to have feedback on effects this change of language of instruction has on the overall learners' understanding of mathematics English word problems in standard 5. This will assist curriculum designers to reflect on how much the change of language of instruction is affecting performance of learners so that if possible proper adjustments are tackled and overall directions be followed with an aim of minimizing misconceptions and errors arising as a result of a change of language of instruction. Realizing that mathematics as a subject depends very much on language as a tool of communicating concepts and ideas hence there is need to look at language that is appropriate to the learners' understanding of mathematics at each stage of learning especially where there has been an immediate change of language of instruction.

Mathematics has been chosen in this study because it is one of the subjects with a number of concepts, word problem exercises and specialized terminologies which are good ground for testing language misconceptions and errors that might arise due to immediate change of language of instruction especially from first to second language, English.

1.3 Theoretical Framework

This study was grounded within Vygotsky's social constructivism framework. In social constructivists' views, knowledge is constructed through learners' interaction with others. Vygotsky (1978) contends that the major role of language in the development of learners' understanding can be explained in two ways as below.

Firstly language accommodates a medium of learning. This means that learning can basically take place in social context and social interaction where language of learning and teaching is seen as a powerful tool (Sabri, Evrim and Aysel, 2005). Vygotsky, the father of social constructivism theory claims that learning occurs through a dialogue (Vygotsky, 1978). This dialogue is initial interment, meaning that it takes place between a teacher and students or between students or between texts and readers (Yang and Wilson, 2006). However for a dialogue to be fruitful learners must be familiar with the language used for communicating ideas and knowledge (Sabri et al, 2005). This means that Learners must interact with the teacher and among themselves in order to share the meaning of words and concepts in mathematics. Huetinct and Munshin (2004) contend that according to social constructivism theory learning mathematics requires construction and not merely passive reception and that mathematics learning should be viewed as both a process of active individual construction and a process of enculturation into the mathematics practices of a wider society. It is therefore at this juncture that language plays an active role in facilitating the process of mathematics acquisition.

Secondly, language of instruction is a tool which helps the child to construct a way of thinking (Vygotsky, 1978). According to the Vygotsky's social constructivism theory of learning, concepts cannot be acquired in the conscious form without language and that a child cannot have a conscious understanding of concepts before they are explained in a related context using a language that is familiar to the learners (Sabri et al, 2005). Adler (2001) advises that mathematics is difficult not because transmission is impossible but because specificity of mathematics itself imposes stringent demand on communication hence dependent on linguistic means and that new topic means new terms, word problems, definitions, symbols and terminologies, all of which require proper mediation using a language that is familiar to learners.

In support of social constructivists' theory, Nickson (2003) argues that the language through which mathematics is mediated should not intrude to an extent where it masks the mathematics that is being taught and thus denies learners access to it. Learners must interact with the teacher and among themselves in order to share the meaning of words and concepts. In that case communication is important for construction of concepts during teaching and learning process in the classroom. Vygotsky (1978) further contends that when learners are confronted by challenging problems, the quantity of their talk increases dramatically and language for them is seen as a way of organizing thoughts and actions. Social constructivism theory supports the argument that language is crucial for the development of action and that learners use language to solve problems (Swan, 2006). This is again a clear manifestation that learners in primary school need to be familiar with language of learning and teaching mathematics. Hence any change of language of

learning and teaching mathematics requires an immediate investigation on the effects of language.

Huetinct and Munshin (2004) identified three levels of social constructivism framework: endogenous, exogenous and dialectical. Cummins (1981) advises that endogenous social constructivism denotes learning that is self induced by learners which means knowledge is inside the learner. In endogenous level the role of the teacher is to act as a facilitator in providing experience and that the teacher makes uses of projects, role plays and discovery as teaching approaches or methods (Cummins, 1981). On the other hand exogenous social constructivism denotes learning that is induced from the outside usually by the teacher who takes the role of a lecturer or knower (Huetinct and Munshin, 2004). In exogenous, learning is through reconstruction of knowledge and that assessment is done mostly through objective tests (Cummins, 1981). On another note, Cummins (1981) contends that dialectical social constructivism views learning as occurring through realistic experiences and learners require scaffolding by teachers as well as collaboration with peers. Dialectical social constructivism denotes that knowledge is both internal and external to the learner and that the teacher's role is a lecturer or knower as well as a facilitator (Huetinct and Munshin, 2004). This level emphasizes the role of social interaction in the learner's knowledge construction process through group projects, cooperative pairing and group tasks using a language that is familiar to learners (Cummins, 1981). It is at the level of dialectical social constructivism that the study used as a baseline to achieve its intended purpose.

Nickson (2003) further provides the conceptual tools with which to understand and explain the nature of classroom learning. Nickson (2003) further advises that from the social cultural perspectives' view, the teaching and learning of mathematics in a second language needs to be always understood as three dimensional or aspects such as language, learners' familiarity with the language and transmissions; it is not simply about access to language of learning and teaching (LOLT) but it is also about access to language of mathematics. When social constructivism is applied to the issue of teaching, one should reject the assumption that one can simply pass the information to a set of learners and expect that understanding will result, but communication is far more complex than that (Huetinct and Munshin, 2004).

In support of social constructivism theory, Cummins (1981) highlights two levels of language proficiency: firstly, the basic interpersonal communicative skills (BICS) and secondly, the cognitive academic language proficiency (CALP). BICS refer to the day to day language of natural and informal conversation needed to interact socially with other people (Cummins, 1981). This language is cognitively undemanding since it is easy to understand with simple language structures. On the other hand, CALP is the type of language proficiency needed to read books, participate in dialogue or debate and applied in written tests (Sabri et al, 2005). Cummins (1981) argues that CALP is essential for learners to succeed in school setting since it is a formal academic learning which includes listening, speaking, reading and writing about subject area content material. CALP is cognitively demanding language since it relates to abstract concepts and ideas, specialized vocabularies and uses more complex structures (Cummins, 1981).

The researcher's major interest in social constructivism was also the teacher's use of language to help learners understand construction of mathematical knowledge. This study took those aspects of social constructivism that were related to the area of interest. The discussion of social constructivism theory in this study largely traced its applicability in understanding teaching and learning of mathematics as a communication process with the main focus on the role played by language of instruction used in assisting learners in class construct their own knowledge in order to understand mathematics concepts especially those involving word problems. The researcher again contended that common language problems faced by learners as well as misconceptions and errors those learners would make could easily be observed using social constructivists' views. This framework is therefore in line with what the study intended to find out how learners were coming up with new terms and concepts in word problems that were then communicated in English hence the choice of a social constructivist's views as a guide in achieving the actual results. In the classroom situation, interactions of a learner with the teacher or with other learners during class discussions as well as in the group discussions require the use of language that is familiar to all.

Above all, the social constructivism's theory was useful in this study in the sense that it guided the researcher's interaction with teachers and learners during interviews. Lesson observations and learners' test data were also collected out of social interaction between teachers and learners. The theory was beneficial for it guided the researcher throughout the whole process of data collection, data analysis and during discussion of findings.

1.4 Purpose of Study

The purpose of this study was to investigate the effects of using English as a language of learning and teaching on learners' understanding of mathematics involving word problems in primary school in Malawi.

1.5 Research Questions

In line with the statement of the problem and purpose of the study, the following research questions were posited.

1.5.1 Main Question

What are the effects of using English as a language of learning and teaching on learners' understanding of mathematics involving word problems in standard 5?

1.5.2 Critical Questions

- To what extent is English used as a language of learning and teaching during mathematics lessons in standard 5?
- What are the common language problems that learners face in mathematics in standard 5?
- What are the common language misconceptions and errors that learners make in mathematics involving word problems in standard 5?
- What should be done to overcome such language misconceptions and errors?

1.6 Significance of the Study

This section conveys the importance of the problem for different groups of people that may profit from reading and using the study. Creswell (2009) advises that by including this section, a clear rationale for the study is created. The more audience that can be mentioned, the greater the importance of the study and the more it will be seen by readers to have a wide application (Creswell, 2009).

The study would provide useful information to the ministry of education science and technology on the following three key areas; to consider approving the current language of instruction policy and/or alternatively bilingual education policy from standard 5 to 8 and/or reconsidering changing the current language of instruction policy to extend using first language as a language of instruction in standard 5 in particular in mathematics.

The information is also likely to assist mathematics teachers in standard 5 to select suitable teaching and learning strategies in overcoming learner's misconception and errors that might arise as a result of immediate change of language of instruction in mathematics in particular in areas involving conceptual understanding of word problem activities.

The research findings will also assist learners in primary school to confront their common language problems, misconceptions and errors and provide better understanding of the concepts of word problems in mathematics.

1.7 Definition of key terms

1. Mother tongue and first language

According to Mchazime (1999) both terms can be used to refer to a language a child learns from its mother; the first language the child learns regardless of parents' affiliation; or the national language. Adler (2001) advised that both terms are used to describe the language that a child acquires from birth and which he or she is most proficient. However the terms are problematic in a society where people are competent or proficient in more than two languages or where people speak more than three languages because many children begin to acquire more than one language from their earliest childhood so they do not have first language (Adler, 2001). In this study the two terms are used interchangeably to mean the language that the child is competent and familiar with or the language one is identified as a native speaker by others.

2. Second language

Adler (2001) refers to second language as the term used to describe a language which an individual adds to a first language, often in a formal learning context. Second language is also problematic in multilingual society where children start to acquire two or more languages from earliest childhood so they label English to be the second language when it may be third or fourth (Adler, 2001). In other societies second language is used to refer to foreign language. In this study second language is used to mean English.

3. Language of Learning and Teaching (LOLT)

According to Adler (2001) the term above refers to the language used for both learning and teaching process across the curriculum and give equal importance to both learning and teaching. It is also used to refer to languages used in textbooks, other classroom materials and the language used for examination papers and answers across the curriculum (Adler, 2001). In this study the term has been used as a preference to language of instruction and medium of instruction both of which only refers to teaching and not learning. In this study the languages of learning and teaching are referred to English and Chitumbuka.

4. Bilingualism / bilingual

Adler (2001) refers bilingualism or bilingual as a proficiency in two languages but not necessary equal proficiency.

5. Code mixing or code borrowing

According to Adler (2001) code mixing or code borrowing is referred to insertion of a single word or short phrase within a sentence in another language. Adler (2001) argues that as learners engage in exploratory talk mainly in their first language, mathematics English is mixed into their speech. In this particular study code mixing or code borrowing has been used to mean insertion of Chitumbuka words or phrases into English language or vice versa in the process of teaching and learning mathematics.

6. Code switching

Code switching is when an individual more or less deliberately alternates between two or more languages in the same conversation or use of more than one language in the same conversation (Adler, 2001). The term conversation has been used to mean process of

teaching. It is mostly observed that the language in which education is conducted is very important as the selected language may enhance or impede the quality of education. Therefore, language is an important issue, especially in multilingual classrooms where we have students from different linguistic and socio-cultural backgrounds (Hoffman, 1991).

The language of learning and teaching can also be a problem, especially when the content or concepts being taught are not in the learners' home language (Adler, 2001). Learning certain subjects such as Mathematics in English may be a problem for students whose home language is not English. Learning such subjects in the learners' first language or supplementing English with the students' first language (code switching) can lead to a better understanding of the contents being taught.

Hoffman (1991) view code switching as a communication strategy and it is the situation in which two languages are used in the same utterance. For bilinguals it is normal to move between different languages when talking with each other, and code switching is an essential strategy for them. In this study code switching has been used to mean shifting from English to Chitumbuka or vice versa.

7. Misconceptions

Students' beliefs, their theories, meanings, and explanations form the basis of the term student conceptions. When those conceptions are deemed to be in conflict with the accepted meanings in mathematics, then a misconception has occurred (Li, 2006). The term misconception is commonly used when the learner's conception is considered to be in conflict with the accepted meaning and understanding in mathematics (Hansen, 2014).

There are various terms in the literature that have been used in relation to the discussion of student misconceptions. Some of the commonly used terms are preconceptions, alternative conceptions, naïve beliefs, naïve theories, alternative beliefs, flawed conceptions and buggy algorithms (Li, 2006).

8. Errors

Generally, an error means a simple lapse of care or concentration which almost everyone makes at least occasionally. An error also refers to systematic, persistent and pervasive patterns of mistakes performed by learners across a range of contexts (Li, 2006). In mathematics an error is regarded as a deviation from a correct response or solution of the problem. In this study an error is regarded as a mistake in solving a mathematical problem procedurally or by any other method (Hansen, 2004).

1.8 Organization of the thesis

This thesis has five chapters. The present chapter has given a brief background to present day government's language of instruction policy in education in Malawi from colonial era to the present time. It has also presented the theoretical framework which is an established theory that guided the whole process of this study. Then the chapter has further presented the problem statement followed by general research question, four critical questions and the significant of the study. The chapter ends with definitions of some key terms.

The second chapter presents the literature review that sets the context within which the study was undertaken by looking at trends to the language of instruction policy in

Malawi, role of language in teaching and learning mathematics, effects of teaching and learning mathematics in learners' first language, effects of teaching and learning mathematics in English, word problems in English and misconceptions and errors in word problems. The third chapter presents the research methodology and outlines how the data were collected and analysed. The chapter specifically looks at the research design, pilot study, sampling techniques, methodological approaches, instruments for collecting data and data analysis. The same chapter also looks at limitations of the study and ethical issues.

Chapter four presents the findings of this study based on each method of data collection used. Finally chapter five presents the discussion of the findings based on the identified themes after analysis of data. Thereafter the chapter concludes the thesis by stating the major findings and implications. The thesis ends up with some recommendations made by the researcher and finally areas for further research.

Chapter summary

This chapter has given an overview of this study. It has highlighted the background and contextualized the problem that led to the pursuit of this study. It has given the background to the present language of instruction policy in Malawi. In addition the chapter has describe the theoretical framework, the statement of the problem, the purpose of the study, research questions, significance of the study and organization of the thesis in addition to the key terms as used in this study. The next chapter describes the literature review that was conducted for the study.

CHAPTER 2

LITERATURE REVIEW

2.0 Chapter overview

This chapter examines literature on aspects of trends to the present language of instruction policy in Malawi from the colonial period and then describes role of language in teaching and learning of mathematics. It also reviews the literature on the effects of teaching and learning mathematics in first language and also the effects of teaching and learning mathematics in second language, English. Finally the chapter reviews literature on word problems in mathematics and the chapter closes with a review of literature on a general discussion of common misconceptions and errors in mathematics operations.

2.1 Trends to Present Language of Instruction Policy in Malawi

The current school language policy in Malawi can be traced back to the country's colonial period before Malawi attained independence when native languages were used as media of instructions in the first three years of primary education (Chilola, 2000). During colonial period four languages; Chinyanja, Chiyawo, Chitumbuka and Chinkhonde were used as languages of teaching and learning especially in the first two or three years of primary education (Mchazime, 1996). At independence in 1964, Malawi inherited a language policy in education in which Chitumbuka, Chichewa and English

were recognized as languages of instruction (Kishindo, 1994). Mchazime (1996) further advises that during that period up to 1968, Chichewa then Chinyanja was widely used as language of learning and teaching in central and southern regions while Chitumbuka was used in the northern region.

In 1968, a major shift in the school language of instruction policy in Malawi was made when Chichewa was elevated as a national language and the only language of instruction in all schools in Malawi from standard 1 to 4 and then English took over as language of instruction from standard 5 onwards (Chilola, 2000). This meant that even in mathematics the language of instruction for the first four years of primary education was Chichewa. From 1968 up to 1989, the teacher's guides and learners books in mathematics were in English while the teachers had to render the content in Chichewa when teaching mathematics from standard 1 to 4 (Kishindo, 1994). Mchazime (1996) advises that however during that period Chichewa then known as Chinyanja was widely used as a language of instruction in central and southern regions of the country where as Chitumbuka was the medium of instruction in the northern region of the country. Since then practices concerning the language of instruction in mathematics have been studied by a number of linguistic scholars in Malawi mostly with a focus to the use of native languages in mathematics (Kachaso, 1988; Mchazime, 1996, Chiziwa, 2000; and Bwanali, 2004). However in all of these studies mentioned above, it seems there had been no mention about the effects that learners might face in connection to language change especially in standard 5 where learners started using English as a language of instruction in mathematics

In 1989 the Malawi government revised the primary school curriculum and declared Chichewa to be a language of instruction from standard 1 to 4 (Mchazime, 1996). This was as a result of the mandatory use of Chichewa as a national language and English as an official language during the one party era (Mchazime, 2001). The language of instruction policy had a number of impacts, one of which, in 1989 the government approved that all learners books for grades 1 to 4 except those of English should be written in Chichewa (Mchazime, 1996). This meant that learners' books in Mathematics (standard 1-4) as well were written in Chichewa while the corresponding teachers' guides were still written in English. One problem however was that this policy was being implemented by some teachers who could not speak Chichewa fluently. The result was that such teachers gave instructions in local languages rather than Chichewa and only switched to Chichewa when the ministry of education officials entered their classrooms (Chilola, 2000). This meant that the impact of using English teacher's guide on correspondence to Chichewa text books in such subjects like mathematics in standard 1 to 4 was that learners were learning mathematics using two or more languages of instruction (Chilola, 2000). That was the period between 1989 and 1996.

In 1996, the government announced an extension of the existing school language of instruction policy in a letter that was circulated to all regional education offices and heads of other education institutions. The letter stated that "with immediate effect all standard 1, 2, 3 and 4 classes in our schools be taught in their own mother tongue as a medium of instruction." (MoEST, 28th March, 1996). Mother tongue was used to mean a language commonly spoken in the area where the school is located (Chilola, 2000). From standard

5 onwards, the policy directed that learners should be taught in English (Mchazime, 2001). It was at that juncture that a study was needed to investigate the effects of language on learners understanding of mathematics especially those involving use of word problems in standard 5. Although the justifications expressed by the Ministry of Education Science and Technology were only referring to standard 1 to 4, very little consideration was given to standard 5 where English starts as a language of instruction. Chilola (2000) contends that one of the justifications for the policy was that it could help learners participate fully in the discussion using the language that they are more familiar with rather than struggling with English. However Chilola (2000:4) further argues that “One scenario that has been created by this present language of instruction policy is that learners in standards 1 to 4 are learning mathematics in multilingual.” According to Chilola (2000) this is so because the books which learners are using in standard 1 to 4 are still written in Chichewa but the teachers guides are written in English while the delivery mode of the lesson is in the learners’ first language. On the other hand this present school language policy has created a scenario that some teachers are forced to give instructions to the language that is not commonly spoken in the area of the school thus contravening the policy (Mchazime, 2001). The impacts of using mathematics teachers’ guide written in English while learners’ books are written in Chichewa has already been studied by Chauma (2013) that there is a great deal of code switching and mixing.

In all these circumstances, the researcher suggests that there was need to conduct an investigation to find out the impacts the above practice might carry forward to learners when they immediately start using English as language of instruction in mathematics in

standard 5. The new language of instruction policy allows learners to study English as a subject from standard 1 to 4, eight to ten lessons per week. The researcher argues that the English language learners are covering from standard 1 to 4 cannot perfectly assist learners to understand concepts of word problems in mathematics in standard 5. This in parts agrees with Kachaso (1988:74) who argued that “although standard seven learners have had six years of English instruction, English language taught in previous years is not designed to help learners understand mathematics concepts, terms and ideas.” The researcher is of the view that there is great need to carry out another study to answer the following questions; what languages do learners and teachers use during mathematics lessons in standard 5? What misconceptions and errors do learners usually make as a result of using English as a language of instruction in mathematics in standard 5? A study by Chilola (2000) in Balaka and Mangochi indicated that learners had a positive attitude toward English as a language of instruction in classroom from standard 5 onwards. On the other hand Issa and Yamada (2013) observe that some stakeholders in Mangochi have negative attitudes towards using first language as a language of instruction in lower classes and switching to English in standard 5 because of the communication problems that teachers face in senior classes when using English as a language of learning and teaching. This is also very much in line with what this study intends to carry out an investigation among other things to find out misconceptions and errors that learners make in mathematics English word problems in standard 5 as result of a change of language of instruction from Chitumbuka to English. Mjaya (2010:8) argues that “The justification for this policy change was based on hearsay and systematic research done elsewhere not

in Malawi which established that children learn mathematics better and faster when taught in their mother tongue especially in the first four years.”

2.2 Role of Language in Teaching and Learning Mathematics

Language is a human speech either spoken or written which is also the most common system of communication since it allows people to talk to each other, write their thoughts and ideas (Cockcroft, 1982). Hence, the language of learning and teaching (LOLT) of mathematics refers to the language used for both learning and teaching mathematics across the curriculum which also gives equal importance to both learning and teaching of mathematics (Adler, 2001). This indicates that LOLT is the language used in textbooks, other classroom materials, in examination papers, in answers and in classroom discussions across the mathematics curriculum in standard 5. Adler (2001) observes that LOLT recognizes that teachers and learners should use whatever languages are necessary to ensure that learners understand what they are learning. The language used in learning and teaching mathematics plays a great role in learners’ understanding of concepts and ideas of mathematics especially those found in word problems. Mathematics in Malawi is an important subject in both primary and secondary schools curriculum for among other reasons, it is used as a powerful means of communication and also applied in many other fields like Physical Science (Cockcroft, 1982). Hence the teaching of mathematics should consider the role of LOLT and whatever language is used for learning and teaching purposes, one would expect learners have some knowledge of that language. This is because language of learning and teaching has an effect on learners’ performance of mathematics word problems (Kachaso, 1988).

In the first place, Orton (1987) argues that LOLT facilitates thinking among learners. “The language used for thinking is always likely to be the first language thus mathematics communicated in one language might need to be translated into another to allow thinking and then would need to be translated back in order to converse with the teacher.”(Orton, 1987:137).This agrees with findings of the study by Setati, Molefe, Duma, Nkambule, Mpalami and Langa(2008) which indicated that the strategy of translation of English word problems into learners’ first language improves learners’ comprehension of the word problems. However the study has further indicated that when mathematics word problems including mathematical terms are translated into learners’ first language, the learners find the term harder to understand than when they are presented in English (Setati et al. 2008). However Kazima (2008) argues that sometimes it might be the teacher translation that was problematic.

Secondly, Ali et al (2014) advises that LOLT facilitates talks in the classroom which involves talk of teachers and the talk of the learners. These can have a deep impact on the other for better or worse. In the instruction of mathematics, paying attention to language is important because it is a dimension that is quite pertinent to classroom operations for language is used by learners to talk mathematics (Ali et al, 2014). For learners to talk the concepts of word problems as a group or pair in standard five they really need to master the language of learning and teaching otherwise a lot of language related problems, misconceptions and errors might be observed. For mathematics concepts to be well understood by learners, it is necessary that learners talk the concepts thoroughly in a familiar language which they all understand. If learners want to get along with word

problems activities, comprehension has to be achieved with translation, interpretation and extrapolation (Kachaso, 1988). This supports also the findings by Bardillion (2004) that learners' ability in solving word problems depends on how learners translate phrases into mathematical symbols. However, Bardillion (2004) advises that translating word problems nowadays is the most difficult task for learners especially in the elementary level where English is used as a language of instruction. It is through discussions that learners could be required to put mathematics word problems or statements into other forms or other ideas and understand interrelation between mathematical statements and ideas. The researcher argues that this is only possible if learners understand the language of instruction used. Kachaso (1988) observes that if teachers are to convey concepts successfully to their learners, they have to learn to talk about and around the concept in a familiar language. A study by Kachaso (1988) further revealed that learners instructed in a familiar language, Chichewa performed better than those instructed in English because they were able to talk the mathematics statements found in word problems.

Furthermore, Orton and Frobisher (2005), Ellerton and Clarkson (1996), Thurston (1995) and NAEP (2009) contend that LOLT is a vehicle for communicating ideas and thoughts. In this case language of instruction is a requirement for learners in the classroom to understand mathematics concepts and procedures that are involved in word problems. This is basically in line with Ali et al (2014) that language is a major means of communication within a classroom and that learners use LOLT to construct understanding as they process mathematical ideas and concepts in discussion. Language is also used in academic spoken and written discourse communicating information to the

lesson content as well as for academic activities such as analyzing, explaining and evaluating content ideas and processes in mathematics (Solomon and Rhodes, 1995). It is therefore the interest of this study to find out if the teaching of mathematics really depends on the level of learners' LOLT mastery in terms of all aspects and components explained by the teacher or by sources such as text books or other reference materials in particular in standard five where learners start using a new language of learning and teaching mathematics.

Realizing that language is a vehicle by which instructions and concepts are communicated to learners to ensure that learning is effective, the teacher should choose a language of learning and teaching which learners should understand best (Chauma, Chimombo and Mtenje, 1996). This is one of the reasons the ministry of education, science and technology would like to see that children in standard 1-4 are more comfortable in discussion in a language commonly spoken in their homes rather than struggling with a language which they are not familiar with or are just learning (Chauma et al, 1996). The point of consideration remains where the learners are going in standard five. Is language of learning and teaching mathematics fulfilling the role as it is stated in literature? Are the learners comfortable with English as LOLT for communicating concepts and ideas to their teacher or among themselves in standard 5 during mathematics lessons? Hence there is great need to answer these questions by studying how learners understand mathematics word problems in basic operation of money in standard five because there are a number of language related issues which can be used as a testing ground. Nickson (2003) advises that if language used in classroom confuses

learners, it basically loses its role as LOLT and itself becomes the message. The change in the language of learning and teaching in particular for mathematics and science in the primary school policy is deemed necessary to ensure that learners in Malawi are able to keep abreast with scientific and technological developments that are mostly recorded in English language however an argument stands to consider effects the change might bring to learners in standard five as they experience concepts especially those involving word problems in a new language of instruction, English. Studies carried out in Saudi Arabia have shown that the issue of a sudden language of instruction switch needs a deeper and longitudinal research to assess the implications of sudden change of LOLT on students understanding and their level of achievement in the mathematics (Elleton and Clarkson, 1996). These studies found out that learners made a number of misconceptions and errors in mathematics as they started using English as a language of learning and teaching (Elleton and Clarkson, 1996).

In a summary, the link between role of LOLT and mathematics has been the focus of much research and debate as argued by Vygotsky that language is the vehicle for thought (Fisher, 2005). Thinking involves the use of words and concepts and one way of assisting learners to develop their thinking is to help them understand the language used to communicate concepts and words by regular practices otherwise a lot of language related problems, misconceptions and errors might arise (Fisher, 2005).

2.3 Effects of Learning and Teaching Mathematics in learners' First Language

First language refers to “The language that a child acquires from birth and in which he or she is obviously most proficient with.”(Adler, 2001:164). First language gives children an opportunity to participate fully in the classroom discussions as they are using the language that is more familiar to them than struggle with the language they are just learning (Chilola, 2000).

Studies conducted in various parts of Africa have indicated that in schools where the learners' first language is different from the predominant language of instruction, learners tend to benefit more when mathematics is taught in their first language (Setati, 2003 and Elleton and Clarkson, 1996). Other studies have also indicated that the use of learners' mother tongue or first language has benefits on school progress especially when it is used in the explanation and clarification of word problems concepts in mathematics (Chitera, 2009). As Chitera (2009) contends further that learners learn mathematics best in a language that they understand since they are involved in the whole learning process. This is in line with Chauma (2013) that learners participate actively in the classes where their mother tongue is used as a language of instruction. In Turkey, a similar study to this present one conducted by Sabri et al (2005) in a science lesson on topic “energy” indicated that learners produced a number of misconceptions and errors as they started using English as a language of learning and teaching from Turkish in grade nine. Although this study was based on science and not mathematics, it has relevance for mathematics instructions. Hence it is the purpose of this study to find out the misconception and errors that learners make in mathematics word problems when using

English as LoLT. In Malawi too, similar studies conducted by Kaphesi (1999), Mchazime and Tiede (2003), the results of the post tests showed that the experiment group which used native languages (Chichewa, Chitumbuka and Chiyao) as LoLT in mathematics performed better than the control group that used English. This meant that the use of native languages as a medium of instruction had an effect on learners' understanding of mathematics. In all these studies the interest was mainly in lower primary schools with a focus on performance of learners. It is therefore the interest of this study to find out the language problems, misconceptions and errors that learners make in standard five in mathematics particularly those involving English word problems in the topic 'basic operations of money.' This study also seeks to find out strategies mathematics teachers and learners in standard five use to overcome language problems, misconceptions and errors in mathematics especially those involving word problems in 'basic operations of money'.

Orton (2004:169) observed that "Even though several studies have shown that the language used for thinking in mathematics is almost the first language there are a number of problems which often need attention with African languages." As Orton (2004) further notes that for the Yoruba of Nigeria has no symbols for the numerals or for elementary mathematics operations and has no words for mathematical terms such as octagon and symmetry. In Ethiopia, the ideas of negative numbers and square roots are regarded as foreign and in Nigeria the idea of zero and empty set are very difficult to explain in Igbo (Orton, 2004). Kishindo and Kazima (2004) also contend that in Malawi, Chichewa among other first languages used in teaching and learning mathematics are currently in

adequate as vehicles for conveying mathematical information because the languages lack suitable terminology for expressing scientific and mathematics concepts and ideas. “These findings are important because it shows that using local languages as languages of instruction in teaching and learning mathematics need consideration on how to handle mathematical terminologies to help Chichewa and other local languages overcome their present limitations.” (Kazima 2008:56). If these are not carefully looked into they might have a carryover effect to learners as they start using English as a language of learning and teaching mathematics in standard five. However studies have indicated that major programmes of enrichment have been undertaken in most countries such as Nigeria and Tanzania (Orton, 2004). For instance, in Nigeria the teaching of mathematics in first language has been successful because a glossary of primary mathematics has been developed in some native languages (Bamgbose, 1986). In Tanzania too, mathematical technologies have thus been developed for primary schools on the understanding that the problem rested on ensuring that the learners understood the concepts and not the technological vocabulary (Kazima, 2008). Kazima (2008) further argues that borrowing English words to be used when teaching mathematics using first language makes life easier for learners when they proceed to standard 5 where LoLT is English. The learners do not learn new words for the mathematical terms that they have already encountered since the terms are the same (p.61). Kachaso (1988) further added that learners should be taught mathematics vocabulary and that the authors of Malawi primary mathematics books should be required to devise a glossary of the technical terms or concepts to be learnt in each unit. Teachers would be required to ensure that the terms and concepts to be taught in each unit are also taught to learners in other subjects (Kachaso, 1988). On the

similar vein, Chauma (2013) recently carried out a study on the use of Chitumbuka as a language of instruction in standard 1-4 and challenges faced by teachers who teach mathematics in Chitumbuka in lower classes. The study has exposed some gaps in the use of Chitumbuka as LoLT in mathematics in standard 1-4.

2.4 Effects of Learning and Teaching Mathematics in Learners' Second Language, English

Chitera (2009) argues that colonial languages such as English and French have more benefits for learners when they are used as languages of learning and teaching in primary schools because they are often spoken widely elsewhere in the world. In addition, English is seen as a symbol of power, status and prestige and often used to gain access to tertiary education, employment and businesses among other things valued in life (Chauma, 2013). However, studies related to medium of instructions have shown that learning mathematics in a second language such as English can present difficulties which English language learners experience (Orton, 2004, Brock- Utne, 2002). The place of talk in classroom and the use of discussion between teacher and learners or between learner and learner demands careful thought. Orton (2004:157) later argues that “The extent to which the acquisition or formation of concepts in mathematics in the minds of learners depends on the appropriate use of language is an important issue.” Adler (2001:7) advises that “Most teachers assert that learning mathematics in English while learning to speak English is double challenge for learners as well as teachers.” This is in line with the situation that is in Malawi where learners in standard 5 start learning mathematics in English while at the same time are struggling to master English as a language of

communication. It is therefore the interest of this study to find out the common language problems faced by learners in mathematics in standard 5. Kazima (2008:56) contends that “use of English in teaching and learning mathematics involves use of ordinary English and mathematics English where words and phrases have specific meaning in mathematics.” This is mostly what is referred to as the mathematics register (Pimm, 1987) as cited in Kazima (2008). Mathematics register refers to “the use of English words with particular mathematics functions.” (Adler, 2001:166). The mathematics register includes words from ordinary English but having a specialized mathematics meanings for example word ‘similar’ means proportional in mathematics and ‘a like’ in ordinary English(Kazima,2008).This might cause some language problems among learners in standard five. Learners might have met such words in standard four during English lessons for instance ‘difference’ to mean not a like in ordinary English but when used in mathematics in standard five it means subtract. This simply tells us that teaching and learning mathematics in a language that is not familiar to the learners’ places additional and complex demand on both teacher and learners (Adler, 2001). Hence Kachaso (1988) advises that the vocabulary being used in mathematics word problems ought to be that which learners are familiar with or studying in other learning areas. “The vocabulary learnt in other learning areas should be related to the mathematics vocabulary so that in the end learners are familiar with the vocabulary they learnt in mathematics text books.”(Kachaso,1988:75).In order to appreciate that why learning mathematics in first language is important, people should understand that learning the language is one thing and learning concepts of subjects like Science and Arithmetic is another thing (Chauma et al, 1996). This means that teaching a concept to a child in a language which the child

does not understand means presenting two problems to the child, both of which he/she have to deal with simultaneously (Chauma et al, 1996). This was yet another important area that this study wanted to find out to what extent English was used as language of teaching and learning during mathematics lessons in standard 5.

Adler (2001) further contends that switching between the learner's first language and English by learners and the teacher has enhanced the quality of mathematic interactions in classroom. Although it is well known that learners at primary school are being prepared for secondary school education, the introduction of English mathematics word problem should not be delayed too long (Adler, 2001). Kachaso (1988) advises that introducing English word problems very late might affect standard or results at secondary school. "An alteration to a late start of English instruction in teaching and learning mathematics word problems would be the promotion of code switching during teaching." (Adler, 2001:74). Research findings into the complex relationship between code switching and mathematics teaching and learning have further revealed that code switching per se does not impede mathematics teaching (Setati et al, 2008). The question that needs to be answered is: Are teachers and learners using code switching at particular cases in standard 5 during mathematics lessons or are they confined to the language of instruction policy? It is again the interest of this study to observe the actual situation on the ground thus to what extent is English used as language of learning and teaching mathematics in standard five. However some studies have already shown that there are ongoing dilemmas for the teacher as to whether they should encourage learners to use their first language in groups or whole class discussions and these dilemmas pivot on

learners' need to access the language of instruction in which critical assessment takes place (Adler, 2001:73). These dilemmas can well be reduced by accepting the concept of code switching or code mixing to be freely used by both teachers and learners in standard 5 during mathematics lessons. Code switching in a language of instruction entails switching between a language of instruction and another language (Chauma, 2013). Code switching can involve a word, a short phrase and one or several sentences (Setati et al, 2008). Studies have already indicated that code switching takes roots in standards 3 and 4 where teachers substitute words or phrases in Chitumbuka with words or phrases in English when mentioning terminologies of certain mathematical concepts and ideas (Kachaso, 1988; Chauma, 2013:). The purpose of code switching and code mixing is mainly to achieve communicative purposes (Adler, 2001). Countries such as Tanzania, Kenya and South Africa code switching or mixing is freely used to support mathematics teaching and learning (Chauma, 2013). However results from another study conducted in Tanzania by Brock- Utne (2002) revealed that learners in a classroom in which English was used as a language of learning and teaching switched to Kiswahili during group discussions and later lowered their voices or stop talking whenever the teacher approached the group (Chauma, 2013). The findings by Kachaso (1988) indicated that code switching instruction produces higher results in mathematics English word problems than exclusively English instructions. Setati et al (2008) argue that use of first language in classroom does not have to be in opposition to English. The two languages can be used together in classrooms so that learners can access the mathematics while at the same time they have access to English (Setati et al, 2008). These results are in line with Kazima, Pwele and Kasakula (2011) that home languages of learners can be used as a resource to

aid learners understand mathematics in a multilingual classroom. The findings by Kazima et al (2011) clearly showed that teachers and learners were happy with the approach of supplementing English with learners' home language.

However, it seems none of the above studies has said anything on the effect of language of instruction in the learners understanding of the word problems in standard five and their accompanying language problems, misconceptions and errors that learners face. The current study is therefore unique for it will fill in that gap.

2.5 Word Problems in Mathematics

Orton (2006) refers to a word problem as simply a question which requires the application of mathematics in order to achieve a solution but in which a required procedure has first to be extracted from within the sentence. In another way, Jonassen (2004) refers to a word problem in mathematics as a story problem. Word problems are familiar to learners all around the whole world and describe those questions which require the application of mathematics operations to achieve the solution but in which the appropriate procedure first needs to be identified within the sentences (Orton and Frobisher, 2005). That is where now bringing the issue of familiarity or competence of language of learning and teaching in mathematics comes in. Orton (2006) contends that word problems are often not particularly novel being frequently another way of providing practice of simple algorithm but require the application of the four major basic operations of mathematics; addition, subtraction, multiplication and division. Learners need only to master a particular basic operation through regular practices at each stage of solving word

problems when they have developed a full knowledge of language used otherwise a lot of misconception and errors may arise (Orton, 2006). The purpose of using word problems is usually a worthy one of trying to provide real life settings for the application of skills, facts and procedures (Orton and Frobisher, 2005).

Kazima (2008) advises that comprehension of mathematics word problems is another area that highlights the effect of language in learning mathematics. This is however supported by Kalejaiye (1990) who argues that the major difficulty for second language learners in solving English word problems is their ability to read English. Length of English words and sentences clearly affects the difficulties of reading and understanding word problems (Orton and Frobisher, 2005). Hence it is the interest of this study to find out the English reading ability of learners in standard five and again to look at an extent English is used as a language of learning and teaching during mathematics lessons. However findings by Fasi (1999) have shown that the more competent the learners are in English, the better they are in comprehending word problems in mathematics. Similar studies conducted in Malaysia revealed that teaching and learning mathematic using second language, English in most cases the teacher's explanation was carried out using both Malay language and English and that there was a lot of repetitions in explaining mathematical concepts, terminologies and word problems (Ali et al, 2014). Other studies have also revealed that learners who are found to be very weak in the second language of instruction have the tendency toward ill comprehension of the mathematics word problems as well as poor participation in mathematics classroom discourse (Setati, 2003). For learners who are acquiring the second language of instruction as well as learning

mathematics, the language of mathematics is another source of difficulties and confusion hence have to cope with difficulties of learning to understand the special terminologies and syntax of mathematics (Yushau and Bokhali, 2004). However research has also shown that English language difficulties with word problems are also common among first language speakers (Orton, 2004). However one would expect that first language speakers have difficulties mainly with the mathematics English while second language speakers have difficulties in coping up with the ordinary English language which they are not competent with as well as the mathematical English (Kazima, 2008). Setati et al (2008) argues that the problems for learners when working with English word problems are not only with terminologies but comprehension with entire word problem. It is clear that all these might result into learners making a number of misconceptions and errors in mathematics as they start using English as LoLT in standard 5. That's what this study intends to find out the actual misconception and errors that arise as a result of language in mathematics in standard 5 and the strategy that both teachers and learners use to overcome such language problems, misconceptions and errors. Kalejaiye (1990) contends that the language used in stating word problems should always be kept simple within the level of the learners' knowledge and that the mathematical vocabulary used in such word problems should be already familiar to learners. Kalejaiye (1990) further argues that integrated approach to teaching mathematics is one way of enhancing familiarity to English vocabulary found in word problems. In this approach vocabulary learnt in other learning areas bears resemblance or have a direct bearing to those learnt in mathematics which helps learners to understand word problems in mathematics. The integration can be

in two major ways: integrated common syllabus or contact and collaboration between language teachers and mathematics teachers (Kachaso, 1988).

Research has further shown that many learners with low competence in English perform better on the non-verbal mathematics than on mathematics equivalent word problems (Kazima, 2008). This is a clear indication that the English in the word problems confuses and misleads many learners even when the mathematics involved is simple (Orton, 2006). There was really a need to prove this one with standard five learners as they start using English as LOLT. Other studies done outside Malawi have indicated that many learners mechanically add, subtract, multiply or divide whatever numbers they are given in a word problem with very little regard to the problem content (Orton, 2006). Orton and Frobisher (2005) argue that this appears to be a problem of learning rather than understanding of the language of LOLT. Another well established findings on word problems is that one step multiplication word problems are often answered by using multiplication and that the most frequently observed error in word problem is to divide rather than to multiply and to subtract rather than to add (Orton, 2006). The results of the significant study of children's response to the word problems involving basic mathematics operations such as addition and subtraction undertaken in Israel suggest that there are particular difficulties for children in recognizing the correct operation where verbal cues 'more or less' are used which later led learners to select a wrong operation (Haylock, 2011). However this contradicts with findings by Adetula (1990) that the cue words more, less, and share prompt learners to add, subtract and divide respectively when they appear in word problems. This simply shows that learners sometimes tend to look for cue words or short

phrases and to respond to them rather than try to understand and grasp the logical structure of the word problems (Haylock, 2011). This seems to agree with Adetula (1990) that when learners do not understand the word problems they often resort to cue- word or short phrase strategy that is searching for word which give them hint of which arithmetic operation to carry out. However Adetula (1990) noted that the use of cue words enhances rote memory. In a parallel study, results on word problems activities involving basic operations of money showed that learners performed better in multiplication where the multiplicand (number being multiplied) is a whole number or decimal and multiplier is a whole number rather than where a multiplicand is a whole number and multiplier is a decimal for instance milk cost 90p a litre, how much for 0.8 litre? (Haylock, 2011). Learners seem to have the mistaken idea that multiplication always makes things bigger, whereas in this case the product is smaller than the multiplicand (Orton, 2006). Hence Kalejaiye (1990) suggests these three abilities for success in solving word problems; comprehension of English language, understanding of mathematical vocabulary and the ability to calculate with numbers. According to Hansen (2005), there are five sources of misconceptions and errors in children when solving word problems; reading ability, comprehension skills, transformation skills, process skills and encoding (converting from words to numbers). Hansen (2005) further contends that about two-thirds of the errors made when solving word problems occur at the first three stages. Hansen (2005) further advises that another problem that learners encounter with word problem is when they try to utilize their everyday experiences of situations to solve the problem at hand. Nyabanyaba (1999) as cited in Hansen (2005) argues that answering the word problem according to learners' common sense knowledge as opposed to using school

mathematical knowledge can sometimes hinder the actual word problem solving. Kalejaiye (1990) finally suggests that learners should be guided to solve word problems as follows:

Step 1; let learners read and reread the word problem to understand its meaning, identify what they are given and what they are required to solve. At this stage teacher should ask questions which make it clear that learners understand the word problem such as what are you given? What are you asked to find?

Step 2; learners should be assisted to form a mental picture of the problem and then use the numbers in the problem to form a relationship between them using an appropriate mathematics methods. The teacher should ask questions which help the learners to set up the problem.

Step 3; learners should perform the required calculations using addition, subtraction, multiplication and/or division appropriately.

Step 4; finally learners should check the correctness of their answers.

2.6 Misconceptions and Errors in Mathematics word problems

Although errors and misconceptions are related and in most cases occur simultaneously, they are different. In this study the word error is used to refer to systematic, persistent and pervasive patterns of mistakes performed by learners across a range of contexts (Li, 2006). An example of an error is where a learner multiplies a number by zero and finds the product as that number. Radatz (2009) identified two types of errors; unsystematic errors which are unintended, non-recurring wrong answers which most learners can

readily correct by themselves according to research findings and systematic errors which are recurring wrong responses methodically constructed and produced across space and time. As Radatz (2009) advises further those learners' errors are sometimes the symptoms of misunderstanding of a particular concept. This is further supported by Hansen (2014) who argues that an error could also be the results of carelessness, misinterpretation of symbols, lack of relevant experience or knowledge related to the mathematical concept and ideas or sometimes as a result of misconceptions. Studies have shown that some errors can also be exacerbated by teachers making assumptions about children's experience on a particular concept (Haylock, 2011). Radatz (2009) later explains that learner's errors in mathematics involving word problem activities can be categorized by following through word problems solving stages such as reading texts, comprehension, calculation and checking. As Radatz (2009) contends further that various causes of errors in mathematics can be identified by examining the mechanisms applied in obtaining, processing, retaining and reproducing information in mathematics tasks. The following four categories of errors were identified by Radatz (2009): errors due to processing iconic or words representations, errors due to deficiencies of mastery pre requisite skills, facts, and concepts, errors due to incorrect associations or rigidity of thinking later leading to inadequate flexibility in decoding and encoding new information and the inhibition of processing new information and errors due to the application of irrelevant rules or strategy.

Studies mentioned earlier on have clearly indicated that learners perform poorly in word problems solving in mathematics. In the light of that, Fajemigagba (1986) investigated

factors responsible for students' poor achievement in mathematics word problem. Among factors identified included misconception of mathematical statement, which resulted to errors. Hence studies done by Fajemidagba (1986) identified two types of reversal errors usually committed in Mathematics word problem solving. These are static syntactic error and semantic error. The static syntactic error is defined as the error committed due to direct translation of the given word problem or word matching (Fajemidagba, 1986). On the other hand the semantic error is committed as a result of inadequate understanding of the meaning of the statements of the word problem and their relationship (Adler, 2001). These are some of the errors committed as a result of interchanging of mathematics operations due to misunderstanding of cue words found in the word problems. In view of the identified areas of learners' difficulties with mathematical statements, such aspects of mathematics are poorly responded to in both qualifying and terminal mathematics tests (Salman, 1998). It has also been observed that students excel more in numerical problems than word problems (Fajemidagba, 1986). Fajemidagba (1986) further affirmed that students at the secondary or primary level have great difficulties in solving word problems in mathematics, and that such difficulties result to poor performances in mathematics (Salman, 1998). Cummins and Wiemer (1988) found that success in working out word problems is related to comprehension of the text and the language in the text. When a student makes errors and arrives at a wrong solution, it is often a correct solution of the word problem the student thinks (s) he is solving (Li, 2006). In other words students solve correctly the problem as it is constructed in their mental representation of the problem text. Research on word problems has revealed that addition and subtraction word problems can be placed in different categories according to

semantic structures in the text (Cummins and Wiemer, 1988). If the content of the word problem is made more explicit without changing the semantic structure, the number of students solving the problem successfully will raise (Cummins and Wiemer1988).

Studies have further shown that when children make errors in mathematics involving word problems, it is mostly often due to misconceptions of the problem situation grounded in insufficient understanding of the semantic schemes of the word problems (Radatz, 2009). Systematic errors are symptomatic of a faulty line of thinking causing them referred to as a misconception (Radatz, 2009). However misconceptions are often hidden from the undiscerning observer. Sometimes misconceptions can even be hidden in correct answers (Li, 2006) when correct answers are accidental. Educators need to listen carefully to determine why learners give answers they give so that they can correctly follow learners' errors (Li, 2006). On the other hand, the term misconception is defined as the learner's preconception or a theory that is considered to be in conflict with the accepted meaning and understanding in mathematics (Hansen, 2014). This simply means that misconceptions occur when a learner believes in a concept or idea that is objectively false for instance the first number to appear in a word problem involving subtraction of money is a subtrahend. Misrepresentation of mathematics concepts is not a misconception but may produce a misconception (Li, 2006). Misconceptions could be the misapplication of the mathematical rule, an over or under generalization or an alternative conception of the situation (Hansen, 2014). It is important to note that misconceptions are not limited to a particular learner, concept or language. Numerous studies have shown that learners have many naive theories, preconceptions, or misconceptions about

mathematics that interfere with their learning (Li, 2006). Because learners have actively constructed their misconceptions from their experiences, they are very much attached to them and sometimes find it difficult to give them up (Haylock, 2011). Misconceptions must be deconstructed and that primary school teachers must help learners reconstruct correct conceptions of mathematics word problems. Allen (2007) suggests that it is sometimes helpful to confront learners with counterexamples to their misconceptions since a self discovered counter example will always have a far stronger and lasting effect.

2.7 Chapter summary

The chapter started by reviewing literature on the trends to the present language of instruction policy in Malawi since colonial era. The chapter has looked at major shifts that took place in 1968, 1989 and 1996 where the language of instruction policy emphasized the use of English as LOLT from standard 5 onwards. In view of that the researcher decided to review literature on the role of language in teaching and learning mathematics. The review has clearly indicated that LOLT is used for communicating mathematics concepts and ideas but also facilitate thinking. Hence the researcher further reviewed literature on the effect of teaching mathematics in first language and in second language, English respectively. The review of literature has revealed a number of gaps when English is used as language of instruction in mathematics. The gaps have been highlighted in the review of literature on word problems in mathematics and misconceptions and errors in mathematics. The next chapter discusses the research methodology and includes the pilot study which was conducted prior to the main study.

CHAPTER 3

RESEARCH METHODOLOGY

3.0 Chapter overview

In Chapter Two the researcher reviewed related literature from both international and national sources. The literature review discussed dealt mainly with effects of language on teaching and learning mathematics especially those involving word problems in primary school. This chapter explains the main methodological constructs that were employed in various stages of the study. This discussion includes a research design, study site, a review of the methods that were used in different stages of the study and their validity and reliability, sampling procedures, the pilot study, the research main study, data collection instruments, data collection techniques, data analysis methods, limitations of the study, a consideration of ethical issues and finally a chapter summary.

3.1 Design

First, a research design and a timetable concerning the whole study, classroom lesson observations, interviews with mathematics teachers as well as reflective interviews with learners and tests were identified. Necessary permissions were sought from all responsible offices in order to carry out the research study in a supportive manner. The research was conducted at two primary schools in Karonga district. The purpose of this study was to identify the effect of language on learners understanding of English word

problems in numeracy and mathematics in standard five. Hence, this study used the qualitative research design (Patton, 1990) with a triangulated mode in order to collect data and results that could adequately address the objectives of the whole study. In this instance the qualitative research design was a plan and a way of obtaining answers to the research questions. The ethnographical approach was used in this study whereby classroom lesson observations and interviews were also used as data collection methods.

According to Creswell (1997) qualitative research is an inquiry process of understanding based on distinct methodological traditions of inquiry that explores social or human problems. He further contends that in qualitative research design a researcher builds a complex holistic picture, analyses words, reports detailed views of informants and conducts the study in a natural setting (p.15). Qualitative method has been chosen in this study because the researcher wanted to explore and present a detailed view of the problem under examination of participants own interest. As Patton (1990) argues that qualitative researchers are concerned with understanding human behaviours from the participants own frame of reference. Qualitative method was also chosen because of its probing nature and its flexibility for detailed information as the researcher listens to the participants who are the key informants (Creswell, 1997). Above all qualitative research design was chosen to provide the researcher with a deeper and richer understanding of the research problem under study. Triangulation was used to increase the validity of data and to evaluate the accuracy of measuring tools. In this study, triangulation was achieved by making use of four data collecting instruments or tools. Triangulation methods use multiple forms of data collection, such as focus groups, observation and in-depth

interviews to investigate the evaluation objectives (Patton, 1990). Utilizing multiple data collection methods leads to an acceptance of reliability and validity when data from the various sources are comparable and consistent (Sallant and Dillman, 1994). Punch (2009) argues that using triangulation to gather and evaluate data may assist to increase the validity and reliability of the research study and help to investigate the research questions since this method is primarily concerned with human understanding, interpretation and is a field of inquiry in its own right. The qualitative procedure or method was used to collect data from classroom lesson observation, interviews with mathematics teachers and ten learners selected from each school and learners' test. There were four lesson observations conducted from each school with a focus on misconceptions and errors that learners made in particular on word problem activities in classroom exercises as well as test scripts for twenty learners who were selected based on their contribution during classroom observations.

3.2 Study site

The research was conducted at Mbasha Nkhoso zone in Karonga district. The district was purposely chosen because of two reasons; firstly because of resource constraints in terms of finances and time, secondly it was due again to the fact that the targeted languages, Chitumbuka was used as a language of learning and teaching in lower primary school and English was used from standard five onwards.

3.3 The pilot study

A pilot study was essential to refine all the four data collection instruments that were used in the main study and to identify any other problems in the design. According to Cohen et al, (2000) the following are reasons for a pilot study; in order to test the instruments thus check for clarity and ambiguity in questions, logical ordering of questions and any problem that has been experienced. Secondly, to find out whether participants understand what they need to do and make adjustments depending on the responses. As such piloting enabled the researcher to establish the usefulness of the instruments and made some changes where appropriate. The researcher conducted a two-phase pilot study to gather information about the following data collection instruments; lesson observation checklist for class teachers, interview guide for learners, test instrument and sample interview guide for mathematics teachers. The pilot study involved administering and evaluating all the four data collection instruments. In that stage, the researcher found that some structural changes needed to be made to the lesson observation checklist for teachers as well sample interview guide for subject teachers. Therefore, the researcher organized a second phase to include the changes that were made on the two instruments and later re-evaluate all the data collection instruments which were finally used to collect data in the main research study.

3.3.1 Sample for pilot study

The pilot study was conducted at one school in Mbasha Nkhoso Zone where the main study was also conducted. The school for pilot study was selected using convenience sampling also known as opportunity or accidental sampling (Gall, Borg and Gall, 2003).

This was done because the school was closer to where the researcher lived, readily available and convenient. The strength with convenience sampling is that it is less costly and time consuming and easy to administer (Gall, Borg and Gall, 2003). However the researcher was aware of the limitations of the convenience sampling. For instance the researcher may have used a sample with less representative of the targeted population and that there might be greater likelihood of error due to the researcher or subjects bias. The pilot study was conducted in standard six. The class was selected using purposeful or purposive sampling. This was done because of the following reasons; first, in standard six English was used as a language of learning and teaching in numeracy and mathematics. Second, the targeted topic ‘basic operation of money’ was also covered in standard six during the period of that pilot study. As for mathematics teacher, purposeful sampling was used in order to target the key informant who dealt directly with the teaching of mathematics in standard six. Purposeful sampling involves selecting particular elements from the population that will be the representative or informative about the topic of interest (Gall, Borg and Gall, 2003). The strength of purposeful sampling is that judgment is made by the researcher about which subjects should be selected to provide the best information to address the research objectives (Creswell, 2009). The researcher initial did not reveal to the participants that standard 6 was chosen for pilot study to be conducted in standard 5 at the same school but rather the two studies were different ones. This was done to prevent any contamination of results with the main study.

The class had ninety three learners which were all involved during classroom lesson observations. Out of those ten learners were selected for interview and twenty learners

were also selected for the test. All ten and twenty learners were selected based on their participation and contribution during classroom observations. These were learners of both sexes and mixed abilities. In selecting learners for both interviews and test the researcher used stratified sampling. This was done because the researcher wanted to select learners of both sexes and of mixed ability. In stratified sampling, the subjects are divided into subgroups or strata characteristics for instance gender and level of education and then samples are selected randomly from each subgroup (Gall, Borg and Gall, 2003). In this study learners were first divided into two subgroups according to gender and in each subgroup the researcher further divided learners into two minor groups based on ability making a total of four small groups. The researcher then randomly sampled ten learners and twenty learners for the interviews and test respectively from each small group. The major strength of stratified sampling in this study was that each gender was represented during the interview and test. However the researcher was aware of the limitation of stratified sampling. For instance the researcher may not have correct proportions from each group. The pilot study was conducted for five days during which data collected assisted the researcher to make refinements on some original data collection instruments.

3.3.2 Data collection instruments for pilot study

In order to get enough data to address the four research questions, the researcher decided to administer the following four data collection instruments in that pilot study:

3.3.2.1 Lesson observation checklist for teachers

The lesson observation checklist for teachers was necessary in order to collect information through classroom observation that could ably address all the four research questions. The original instrument had thirteen items (appendix 1A). The first six items focused very much on addressing the question ‘to what extent was English used as a language of learning and teaching during mathematics in standard five?’ the researcher was basically looking at languages that were used by both teachers and learners during the whole process of learning and teaching mathematics involving word problems. That of course included teachers’ explanations, learners’ responses and language used by learners during group discussions. The seventh item was used to address the research question ‘what are the common language problems that learners faced in mathematics in standard five?’ items nine and eleven addressed the third research question ‘what are the common language misconceptions and errors that learners make in mathematics involving word problems?’ items eight, ten and twelve addressed the last research question ‘what should be done in order to overcome such common language problems, misconceptions and errors?’.

The lesson observation checklist was used by the researcher to record data while teaching and learning process was in progress. It was also used to collect information from document analysis of learners exercise notebooks as well as marked scripts of a test on language related problem, misconceptions and errors made by learners on the exercise given by the teacher after each lesson and at the end of the topic respectively. Information collected was written in the spaces provided by the checklist in short notes and later

expanded by the researcher. A total of two lesson observations were made in the first phase and one observation in the second phase of the pilot study. From the pilot study, it was discovered that the instrument was fulfilling its intended purposes. However it was also learnt that the items on misconceptions and errors needed to be combined following the duplications that were experienced by the researcher. As a result of that, the instrument for main study was modified by combining these two items together: “what were the misconceptions made by learners throughout the lesson? What were the common errors made by learners throughout the lesson?” (Items 9 & 11 respectively) (Appendix 1A). The new version of the item read “what were the misconceptions and errors that learners made?” (Appendix 1B, item 8). That also applied to the following three items: “How the teacher and learners are overcoming such language problems? How the teacher is overcoming misconceptions made by learners? What were the methods used to overcome such errors (items 8, 10 & 12 respectively) (Appendix 1A). These were also combined to make one item. The new version of the item reads “How is the teacher overcoming such language problems, misconceptions and errors made by learners in the lesson?” The following last item; “General comments if any” (Appendix 1A, item 13) was completely removed for it did not agree with the objective of the study. Finally the lesson observation instrument for main study had a total of nine items (Appendix 1B).

3.3.2.2 Interview guide for learners

The sample interview guide for learners was necessary for it was mainly used to collect information from ten learners to address the following three research questions; ‘to what extent was English used as language of learning and teaching in mathematics in standard five? ‘What were the common language related problems that learners faced in mathematics especially those involving word problems?’ and what should be done to overcome such language misconceptions and errors?’ The interview guide had five items for pilot study (appendix 3A) of which the first three items were specifically put to address the first research question while the fourth item was to address the research question two and the very last item was to address the research question four. The languages used for communication during interviews were both English and Chitumbuka. Chitumbuka was used in situations where learners had not understood the question.

During the pilot phase all the five questions were responded to as expected hence no further modifications were made (appendix 3B). Ten learners were selected for interview based on their participation during lesson observations in the classroom conducted by the researcher. The researcher called each learner at a time to answer the questions that were on the guide. In some instances the researcher could clarify some questions for learners where necessary. Information collected was written in the spaces provided by the guide. After the interview the researcher summarized the information gathered depending on the research questions.

3.3.2.3 Interview guide for mathematics teachers

The interview guide for teachers was mainly used by the researcher to collect information from mathematics teachers that would address all the four research questions mentioned above. The instrument used for the pilot study had fourteen items (appendix 2A). The first six items addressed the first research question then item seven to item nine addressed the second research question and item ten to item thirteen addressed the research question three while the last item addressed the research question four. Information collected was written in the spaces provided by the guide in short notes and later expanded by the researcher. The interview was conducted in English just once with the mathematics teacher and lasted for almost seventy minutes. From the pilot study it was discovered that the guide was fulfilling its intended purposes. However it was also learnt that the items on misconceptions and errors needed to be combined following the duplications that were experience by the researcher from the respondents. As a result of that the instrument for main study was modified by combining the following two items together: “from your own observation as a class teacher, what are the common misconceptions that learners make with word problems in reference to topic ‘basic operation of money’ in standard 5? What type of errors involving language do learners commit in mathematics word problems in standard 5?” (You may even recite some examples with reference to basic operations of money) (Items 10 & 13 respectively) (Appendix 2A). Likewise, the following three items were also combined: “what do you think should be done in order to overcome such language related problems? What do you think should be done in order to overcome such misconceptions? & what do you think should be done to overcome such errors?” (Items 9, 12 & 14). These items were combined because they were responding to

the related ideas. The combined version of the three items was; “What do you think should be done in order to overcome such language problems, misconceptions and errors?” (Item 11, Appendix 2B). Finally the interview guide for teachers used in the main study had eleven items (Appendix 2B).

3.3.2.4 Learners’ test

The learners’ test was specifically designed to collect information on language related problems as well as misconceptions and errors that learners made in mathematics especially those involving English word problems. The test was administered at the end after learners had learnt all the four ‘basic operations of money’ that involved word problems. It was intended to answer the two research questions; ‘what are the common language problems that learners faced in mathematics involving word problems?’ and ‘what are the common language misconceptions and errors that learners made in mathematics involving word problems?’ The test comprised four items of which one was taken from each basic operation of money but not in the order they were covered during teaching and learning in class (appendix 4A). The test fulfilled its intended purpose because most of the language problem, misconceptions and errors were noted in the learners test scripts.

3.3.3 Pilot study data analysis

The main purpose of data analysis was to make sense of the collected data. Data was analysed using the most common approach to qualitative research known as thematic analysis. In this approach themes are usually identified through coding and sometimes

themes are considered more comprehensive than codes (Bryman, 2008). Texts are then examined for themes and sub themes followed by the development of indexes which later applied to the data. The data is then organised in form of a matrix or thematic chart in which interview extracts are allocated to the respective themes and subthemes (Bryman, 2008).

During the process of data analysis of findings in the pilot study, the information collected through classroom lesson observations, interviews with mathematics teacher and ten learners and information from analysis of learners' exercise notebooks and test scripts was firstly organized and prepared for thematic qualitative analysis. That involved transcribing interviews, sorting and arranging data into different types depending on the sources of information. This was followed by reading and re-reading through the whole data. To ensure reliability and validity in the data analysis and in the findings, the researcher went through the data again and again carefully looking for negatives instances of the patterns. This was also done in order to obtain a general sense of the information and to reflect on its overall meaning (Creswell, 2009). A detailed analysis of data began with a coding process. Coding is the process of organizing the materials into segments of texts before bringing meaning to information (Creswell, 2009). Ideas and concepts were then identified and organized from where overarching themes were built by coding and categorizing those ideas and concepts with a term based in the actual language of the participants. The next step was interrelating of themes or descriptions. At this stage coding was used to generate a small number of themes or categories for a pilot study (Punch, 2009). Themes were then interconnected into a storyline or developed them

into a theoretical model analysed for each individual case and across different cases. Those themes were the ones that appeared as major findings in the qualitative study in that pilot study and were used to create headings in the finding section of the pilot study. A final step in data analysis involved making an interpretation or meaning of data (Creswell, 2009). Last but not least the researcher came up with a summary of themes and findings before organizing the information into a final report of the pilot study.

3.4 The main study

After the first two administrations of the original data collection instruments, the final versions of the data collection instruments were prepared for the main study (appendixes 1B- 4B). The lesson observation checklist for teachers was prepared with a total of ten items (appendix 1B), the sample interview guide for subject teacher with a total of twelve items (appendix 2B) while the interview guide for learners and the learners' test remained unchanged with a total number of five and four items respectively (Appendix 3B and 4B). In addition to the adjustments that were made on the main data collection instruments, the researcher also adjusted the number of lesson observations that were made during the main data collection. The number of observations was adjusted to four for each study school so that each basic operation of money was observed once separately in a week when learners were learning each operation involving word problems. That was done in order to avoid mixing the information on each operation and again to match with the time table of the study schools where each operation was planned to be covered in a week.

3.4.1 Sampling

The sampling frame consisted of all the twenty primary schools in MbashaNkhoso zone. These schools were purposively selected because they were all using Chitumbuka as a language of teaching and learning mathematics in standard 1-4 and then English from standard 5 onwards. In other words all these schools were chosen because they are the ones among other government primary schools in Malawi that are practicing the current language of instruction policy in primary education and at the same time they are the ones affected by the mother tongue education policy that the government is considering to implement. Out of the twenty primary schools in Mbasha Nkhoso zone, only two schools were selected for the study using a simple random sampling method. Simple random sampling is the one that is applicable when population is small, homogeneous and readily available and that each element of the frame thus has an equal probability of selection (Salant and Dillman, 1994).

In this study the idea for simple random selection was done to ensure representativeness (Punch, 2011). This also agrees with Salant and Dillman (1994:67) that “this design gives each element of the targeted group an equal chance of being selected for the study.” Names of all schools in Mbasha Nkhoso zone were written down on strips of paper which were later folded and thrown into an empty mixing carton. The folded pieces of paper were mixed up and later two strips were randomly picked one piece at a time without replacing it back. The two strips picked represented the names of the two study schools for the main study.

In all the two sampled schools, standard five classes were purposively sampled based on the criteria that it was where English started to be used as a language of learning and teaching (LOLT). As Maree and Pietesen (2007:10) observe that “Purposive sampling is used in special situations where the sampling is done with a special purpose in mind.” In this study standard five mathematics teachers were purposively sampled for classroom lesson observations and interview. Mathematics teachers were selected purposefully (Patton, 1990) based again on criteria that they were currently teaching numeracy and mathematics in standard five. Purposive sampling was also used in order to target the key informants who dealt directly in the teaching of mathematics in standard five in the two sampled schools. This agrees with Chauma (2013) who advises that in many cases purposive sampling technique is used in order to access knowledgeable people; those who have in depth knowledge about particular issues, may be by virtue of their professional role, power, and access to networks, expertise or experience. However, sex and age of teachers were not controlled. This is why according to sex, in this study there were only male teachers.

In each study school, ten learners and twenty learners were chosen for interview and test respectively based on their participation and contribution during classroom observations. In selecting learners for both interviews and test the researcher used stratified sampling. This was done because the researcher wanted to select learners of both sexes and of mixed ability. In stratified sampling method, the subjects are divided into subgroups or strata characteristics for instance gender and level of education and then samples are selected randomly from each subgroup (Gall, Borg and Gall, 2003). In this study learners

were first divided into two major subgroups according to gender and in each subgroup the researcher further divided learners into two minor groups according to ability making a total of four small groups. The researcher then randomly sampled ten learners and twenty learners for the interviews and test respectively from each small group at different occasions. The major strength of stratified sampling in this study was that each sex was represented during the interview and test. The second strength was that learners of mixed abilities were involved during interview and in writing test. However the researcher was aware of the limitation of stratified sampling. For instance the researcher may not have estimated correct proportions from each group.

3.4.2 Participants

The study focused on two primary schools where one mathematics teacher in standard five drawn from each school together with all learners in that class were involved in teaching and learning process of basic operations of money. There were fifty learners in school one and sixty three learners in school two. The criterion used for selection of teachers was that the teachers should be those currently teaching mathematics in standard five. Initially, the researcher just asked for schemes of work, lesson plans and all required teaching, learning and assessment resources to ensure that the teachers were teaching the required materials. It was also worthy to note that there was no relationship between the researcher and the two sampled school including also the two mathematics teachers. The researcher was just a lecturer at a teacher's training college within the same zone with the two sampled schools.

3.4.3 Instruments for Data Collection

Data collected through four classroom lesson observations were recorded using lesson observation checklist which was designed by the researcher. Highly structured interview guides were used in order to collect data from interviews with mathematics teachers and learners. Test was used at the end of topic ‘basic operation of money’ for the purpose of collecting information on learners’ overall understanding of English word problems.

3.4.4 Data collection techniques

The research study employed a triangulation technique or method of data collection where the following four methods were used; test administration, classroom lesson observations, interviews and document analysis of learners exercise notebooks and test scripts. The researcher used four qualitative methods in order to ensure triangulation in data collection and that all the methods mentioned above were appropriate because they are used to collect data that provide sufficient information of research findings (Shank, 2002). Triangulation means gathering and analysing data from more than one source to gain a full perspective on the situation you are investigating (Lacey and Luft, 2007). Triangulation in this qualitative research was necessary for checking the credibility and truthfulness of the information collected (Creswell, 2009). Qualitative data collection was done in phases or sequentially starting with data using classroom lesson observations followed by data from reflective interviews with mathematics teachers as well as some learners and finally data from analysis of learners’ exercise notebooks and tests scripts.

3.4.4.1 Lesson observations

Lesson observations were used to collect information during the process of teaching and learning so as to capture classroom practices in relation to the effect of language of instruction that was used in mathematics. Lesson observations were used in order to provide direct access to social phenomena under consideration since you observe and record participants in situation they are instead of relying on some kind of self report (Gall et al, 2003). The type of observation used in the classroom was direct (reactive), non-participant. The researcher was only observing and recording what was going on while participants knew that they were being observed. The focus of lesson observation was to collect data about extent to what English was used as language of instruction, common language problems as well as data about both learners' common misconceptions and errors on word problem activities which the participants might be unwilling to provide during interviews. This agrees with Sharp (2012) who contends that observation technique is commonly used by the researcher for providing supplementary information for the purpose of clarification or triangulation and that it is also ideal research technique for investigating classroom based practices. Using more than one technique of data collection through a process of triangulation is seen as highly desirable as an overarching qualitative study strategy (Gall, et al, 2003). Therefore, the strength of observation is that it can effectively compliment other approaches and thus enhances the quality of evidence available to researcher (Sharp, 2012). During lesson observation notes were recorded to assist in determining what the observed events might mean and to provide help for answering research questions during subsequent data analysis (Punch, 2009). In most cases, observation as a method of collecting data has some weaknesses.

A fundamental potential weakness of observation technique is that it is susceptible to observer bias that means subjective bias on the part of the observer and thus undermining the reliability and hence the validity of the data gathered (Bryman, 2008). This can be because the researcher records not what actually happened, but what they either wanted to see, expected to see, or merely thought that they actually saw. Another potential weakness of observation is the so-called observer effect, which refers to the way in which the presence of an observer in some way influences the behaviour of those being observed (Bryman, 2008). In order to avoid or minimize this, the method of observation used in this study attempted to be as unobtrusive as possible by among other things advising the participants that the researcher had also come to learn something from the learners.

3.4.4.2 Interviews with mathematics teachers

After four classroom lesson observations, the researcher conducted in-depth interviews with two mathematics teachers from two study schools. Interview with each mathematics teacher was mainly used in order to collect additional information on common language problems, misconceptions and errors on word problems activities that learners usually made that could not be observed directly during classroom lesson observations. Thus the researcher conducted interviews after all the four planned classroom lesson observations in order for the informants to reflect on what actually happened during the process of teaching and learning. Interviews were also done particularly for the informants to clarify on certain issues recorded during classroom lesson observations. This agrees further with Sharp (2012) who observes that interview is the principal means of collecting data or for

providing supplementary information for the purpose of triangulation. Punch (2009) advises that interview is a good strategy of accessing people's perceptions, meanings, definitions of various situations and construction of reality and a prominent data collection technique in a qualitative research design. It is further argued that interviews are often used in conjunction with other techniques such as tests and observation or after other techniques in order to flesh out views and information on topics under study (Punch, 2009). In this study, the researcher mainly used structured interview questions because they are flexible in terms of possibilities for probing by the researcher. In addition, the researcher sought to encourage free and open responses while at the same time capture respondents' perceptions in their own words. Each interview session took almost fifty to sixty minutes.

The interview method in this qualitative study had one predominantly advantage thus, it allowed a researcher to explain or help clarify questions on the interview guide thereby increasing the likelihood of useful responses. In other words, it offered the researcher flexibility whereby an answer to a particular question could be followed up with a supplementary question in order to gain greater depth of information. On the other hand interviews have disadvantages. The interviewee may distort information through recall error, selective perceptions and desire to please the researcher. Another disadvantage is that flexibility can result in inconsistencies across interviews (Patton, 1990). To overcome this, the researcher briefed participants that the interview was necessary in order to improve learners' performance in mathematics especially those involving English word problems.

The interview was conducted in English just once with each standard five mathematics teacher from the two study schools. Information obtained from interview was recorded manually on the spaces provided by the interview guide in order for the researcher to use during transcription and actual data analysis.

3.4.4.3 Interview with learners

After a total of four lesson observations were done, the researcher conducted face to face interview with ten learners from each school. The researcher conducted the interviews with ten learners after lesson observations in order to get additional information from participant on language related problems, common misconceptions and errors that learners faced in numeracy and mathematics that usually involved use of word problems activities. Interviews with ten learners from each study school were also done in order for the informants to clarify on certain issues noted by the researcher during classroom lesson observations. Furthermore, it was also used to seek the views of learners on issues of language of learning and teaching in mathematics in standard five. That agrees with Patton (1990) that the hallmark of interviews is the explicit use of group interaction to generate data that would be unlikely emerges otherwise. The technique allows for the observation of group dynamics, discussion and first hand insights to respondent language (Patton, 1990). Punch (2009) advises that this method can be efficient because the researcher can gather information from several learners of different ability. Patton (1990) further advises that interview in classroom situations are important not only to identify errors and misconceptions but also to recognize individual differences among learners. Ten learners were selected for interview based on their participation during lesson

observations in the classroom conducted by the researcher. The researcher called each learner at a time to answer five questions that were on the guide. Each interview session with a learner took about six to seven minutes since most of the questions demanded short responses. In some instances the research could clarify some questions in Chitumbuka for learners where necessary. Information collected during interview was written in the spaces provided by the guide collectively. This was done in order to keep the information safe for the researcher to use during transcription and data analysis. The date and time of interview were also recorded for future reference if need arises. The interview with ten learners from each school was done just once. Both languages English and Chitumbuka were used during interviews with learners. Chitumbuka was again used as a supplement to English in situations where learners had not understood the questions. After the interview the researcher summarized the information gathered depending on the research questions. This was also done for ease analysis of data.

3.4.4.4 Learners' Test

Patton (1990) advises that tests are used when one wants to gather information on the status of knowledge or the change in status of knowledge or they may be used purely descriptively to determine whether the test taker qualifies in terms of some standard of performance. This agrees also with exogenous social constructivism framework of learning which advocates assessment through objective test. In this study test was used in order to gather information on the overall learners' understanding of English word problems in mathematics when all the four basic operations in mathematics were examined in one paper but not in the order they were covered in class during the process of teaching and learning. This was in line with the endogenous level of social constructivism framework where the researcher wanted to use

learners driven exploration and inquiry information to collect data. The test with four items from the topic ‘basic operations of money’ was developed and administered first to the pilot class, standard six that was sampled initially for that purpose. This was done to gauge their validity and suitability of all the test items. After necessary revision especially on spelling and grammar (appendix 4B), the test was finally administered to the two schools sampled for the study on the same day. The test had four items because the researcher wanted to match the total number of items with four mathematics operations so that all the four mathematics operations should be represented. Twenty learners from each study school were selected to write the end of topic test based on their participation during lesson observations. In selection of twenty learners for the test the researcher considered both ability and gender of learners. This was done in order to have a group of participants with mixed ability and of both sexes. Later the test papers were administered and analysed for language problem, misconception and errors.

The researcher however was aware of the limitations of test that many researchers point out for instance Patton (1990) argues that learners’ answers on tests do not show their true level of understanding. On the other hand Patton (1990) contends that studying learners’ procedure can reveal learners misconceptions in mathematics. Therefore the test was a valid instrument in data collection.

3.4.4.5 Document Analysis

The following documents; learners' exercise notebooks and test scripts were analysed. This was done because the researcher wanted to collect additional information on common language problems with word problems, common errors and misconceptions related to language with word problems. This was also done because the researcher wanted to use the information from learners' exercise notebooks to generate some probing questions during interview and also to identify issues to be observed in the next lesson observation. Furthermore, the method was also used to gather information on categories of errors that learners usually made in basic operations of money involving in particular word problems. Furthermore the technique was used in order to further explore the subject by among other things using the information from the two documents mentioned above to generate supplementary interview questions or identify events to be observed (Patton, 1990). This process provides a thorough description of the study participants, context and procedure and an ongoing record activities (Patton, 1990). All learners' exercise notebooks were analysed after the subject teacher had given learners an exercise and marked during each lesson observation conducted by the researcher. At the end of each lesson observation, the researcher collected all learners' notebooks for analysis of common language problems, misconceptions and errors. Likewise after learners had written the test, the researcher collected all scripts also for analysis of common language problems, misconceptions and errors that learners made in mathematics involving word problems for analysis. Common language problems, errors and misconceptions depicted from learners' notebooks and test scripts were recorded on the spaces provided by the lesson observation checklist.

3.4.4.6 Data collection summary table

Table 1: Summary of Data Collection

Research Question	Method	Tool	Source
To what extent is English used as a language of learning and teaching during mathematics lessons?	- Lesson observations - Interviews	- Lesson observation checklist - Interview guides	- Teachers - Learners
What are the common language problems that learners face in mathematics in standard 5?	- Lesson observations - Interviews - Document analysis of exercise notebooks - Test	- Lesson observation checklist - Interview guides for both teachers and learners. - Test	- Learners - Teachers - Learners' exercise books - Test scripts
What are the common language misconceptions and errors that learners make in mathematics involving word problems?	- Lesson observations - Interviews - Test	- Lesson observation checklist - Interview guides for both teachers and learners. - Test	- Teachers - Learners - Exercise note books - Test scripts for learners
What should be done to overcome such misconceptions and errors	- Lesson observations - Interviews with teachers and learners	Interview guides	- Teachers - Learners

3.4.5 Data Analysis

The main purpose of data analysis was to make sense of the collected data. Data were analysed using the most common approach to qualitative research known as thematic analysis or inductive analysis. In this approach themes are usually identified through coding or sometimes themes are considered more comprehensive than codes (Bryman, 2008). Texts are then examined for themes and subthemes where necessary followed by the development of indexes corresponds to codes which are later applied to the data or information collected. The data is then organized in form of a matrix or thematic chart in which for instance interview extracts are allocated to the respective themes and subthemes (Bryman, 2008). The following general thematic/inductive guiding tool to qualitative data analysis was adopted from Bryman (2008):

a. Preparation of raw data files (data cleaning)

In this stage the researcher is formatting the raw data files into a common format

b. Close reading of text

Once text has been fully prepared, the raw data text should be read in detail so that the researcher is much familiar with the content and gains an understanding of the themes and details in the text.

c. Creation of categories

The researcher identifies and defines categories or themes.

d. Overlapping coding and uncoded text

One segment of text may be coded into more than one category. Sometimes a considerable amount of the text may not be assigned to any category, as much of the text may not be relevant to the research objectives.

e. Continuing revision and refinement of category system

Within each category, search for subtopics, including contradictory information is refined. Following above procedure in this study, the whole information collected through lesson observations, interviews and a review of learners' exercise notebooks and test scripts were firstly organized and prepared for qualitative analysis. This in fact involved transcribing interviews, sorting and arranging data into different types depending on the sources of information. This was followed by reading through the whole data. To ensure reliability and validity in the data analysis and in the findings, the researcher went through the data again carefully looking for negatives instances of the patterns. This was also done in order to obtain at least a general sense of the information and to reflect on its overall meaning (Creswell, 2009). After reading data several times, a detailed analysis with a coding process begun. Data was organised into groups called codes using bold letters. Coding is the process of organizing the materials into segments of texts before bringing meaning to information (Creswell, 2009). The information was further organised and reorganized into categories three times where relationships between and among categories were identified. Ideas and concepts were organized from where overarching themes were built by coding and categorizing those ideas and concepts with a term based in the actual language of the participants. The next step was interrelating of themes or

descriptions. At this stage coding was used to generate a small number of themes or categories for a research study (Punch, 2009). Themes were interconnected into a storyline and developed into a theoretical model where possible. Furthermore, themes were later on analysed for each individual case and across different cases. These themes were the ones that appear as major findings in the qualitative study and are used to create headings in the discussion of findings section of this study. A final step in data analysis involves making an interpretation or meaning of data (Creswell, 2009). Last but not least the researcher came up with a summary of themes and findings before organizing the information into a final report.

3.4.6 Limitation of the Study

The study did not face any limitations that affected the results. However, there were some problems that affected proper implementations of this study. In the course of conducting this study, a number of challenges were encountered. Most of the challenges encountered were addressed promptly in order to avoid them affecting the expected results of the study. Firstly time constraint was one of the limitations. The study was done during the rainy season in the months of January and February as such accessibility to one of the sampled schools was really a problem due to poor road conditions and non availability of public transport. That made the researcher sometimes not to visit the school in time as scheduled. That problem could be sorted out by simply rescheduling the lesson observation to later times within the same day or in the following day.

Some of the challenges encountered especially in the first and second weeks of the study were as follow:

- There was a change of subject teacher at one of the schools. The usual one was allocated to another class.
- Abrupt change of timetable for mathematics. Sometimes as the researcher went to class to observe a mathematic lesson, he could find a teacher busy teaching another subject.
- Shortage of classrooms at one of the schools which forced learners to have lessons outside under the tree. When the weather was sometimes bad, the teacher could combine the observed class with another stream.

3.4.7 Ethical Issues

In this study ethical issues were dealt with in the following ways: Prior to conducting a research study, the researcher obtained a written approval from the University of Malawi, Chancellor College, Faculty of Education (appendix 5). Verbal approval from the schools was obtained from all necessary offices such as District Education Manager's office for Karonga district, Primary Education Advisor's office for MbashaNkhoso zone and the Head teachers' offices for both study schools to conduct a research study.

Explanatory letter (appendix 6) was also used in order to gain informed consent from potential participants who were the mathematics teachers for standard five and their learners. That was done in order to protect participants from harm and violation of privacy while at the same time maintaining the integrity of the research and its ethical standards (Briggs and Coleman, 2007). Names of learners were not written on the answer

sheets when writing down the learners' test to ensure anonymity. In addition to that, names of mathematics teachers whose lessons were observed and interviewed including names of the schools where data was collected would be kept anonymous when presenting the results. This agrees with Salant and Dillman (1994) who recommend that if questionnaire or interview guides cover pages contain identifying information such as names and address, they should be immediately destroyed as soon as it is practical in order to ensure confidentiality. The key informants who were the learners and their mathematics teachers were informed that the study was simply for academic purposes and that it would just be presented to a group of university academics/lecturers at the end of the study. The lessons that were observed were not for the public to read through or listen to but rather for the researcher to reread in order to get any points that were missed during the actual lesson observation. Participation was declared at voluntary basis and participants were informed in advance that they had the right to withdraw from the study at any time they wish.

3.5 Chapter summary

This chapter has described the design of the study, study site, the pilot study which was conducted before the main study, sampling procedure for the main study, how participants were identified and the instruments that were used to collect data including data collection techniques and of course how data were analysed. This chapter has further discussed limitations of data collection. This was later followed by ethical considerations that were observed during the study. The next chapter presents the findings of the study.

CHAPTER FOUR

PRESENTATION OF THE FINDINGS

4.0 Chapter overview

This chapter presents the findings of the data analysis of this qualitative study. The study sought to understand the effect of language of instruction on learners' understanding of mathematics especially those involving use of word problems in primary school. The findings of the study are presented in four major sections based on analysis of findings from; classroom lesson observations, interviews with mathematics teachers, interviews with learners and findings from learners' test. Some of the findings are presented in tabular form with the respondents codes; T1 and T2 to mean teacher one and teacher 2 respectively, S1 and S2 to mean school one and school two respectively.

4.1 Findings from lesson observations

This part describes the analysis of findings from lesson observations conducted by the researcher

4.1.1 Background information

Participants were asked about number of learners, education qualification and teaching experience of mathematics teachers in standard 5. The table below shows the information

of analysis of data submitted by the two mathematics teachers before the actual lesson observations were conducted;

Table 2: background information for lesson observations

School	No of learners		Sex of teacher	Education qualification	Teaching experience
	M	F			
S1	25	25	M	MSCE (T2)	17yr
S2	30	33	M	MSCE(T2)	22yr

4.1.2 Language of instruction used

a. In addition of money

From what was observed in addition of money, both languages English and Chitumbuka were used by teachers in the process of learning and teaching mathematics however in most cases English dominated especially by teachers while Chitumbuka was dominated by learners. By teachers, use of Chitumbuka could frequently come in as a complement of English statements for instance at one point T2 said, “You need to add K23573 *na*(and) K35923 *makola* (well) in order to arrive *pa* (at) answer *yaunesho* (correct one).” It was also common when the teachers were giving instructions such as “*luta katole mabuku, khalapansi, tiyenetilembe, walembauli sum iye.*”(Go and get books, sit down, let us write, how have you written this problem?). Sometimes use of Chitumbuka was common when the teachers wanted to stress a point for instance, “this problem *ikukhumba kusazga nakuyeyela.*”(Needs addition with regrouping). Most of the times as the teachers went round marking; they communicated in Chitumbuka when making corrections for learners who had worked out wrong answers for example, “*walemba ule*

apa, uwiikepo 6 apa, pala tasazga na zero answer ninambala ila.” (How have you written here?), put 6 here, if we have added with zero the answer is the number itself). Furthermore, whenever the teachers were emotional, the common language used for communication was Chitumbuka such as *“tikhale cheta, mwasazga uli apa?”* (Let’s be quiet. How have you added here?). Above all when the teachers were revising the work that most learners got wrong, the language used was Chitumbuka. A very good instance was when T1 was revising the following word problem which more than half of the class got it wrong; *Find the sum of K850.00, K2980.70 and K3999.99.* The teacher explained everything in Chitumbuka with full support from learners.

On the part of learners, the first language, Chitumbuka was used frequently. English was used in one word answers and when responding to questions that demanded yes or no answers for example “Have you understood? Do you have any question?” When the teachers gave instructions in English other learners translated what the teachers had said in Chitumbuka to assist those who had problems with what the teachers wanted them to do for instance, “be in pairs” was translated by learners as *“ati tikhale awiliawili.”* (Let’s be in pairs). Each time the teachers asked learners if they had problems with the work covered, they always responded in English “No.” In assisting one another to solve word problems, learners who had ideas of what they were supposed to do, they were explaining to others in Chitumbuka. If the teacher asked questions in English for instance, who can read the following word problem? Learners were heard saying, *“ine ndiwelenge.”* (I should read). Whenever the teacher gave learners work to discuss in groups, the language used in discussions was Chitumbuka but sometimes as the researcher went closer to the

learners to observe what they were doing in their groups, all learners quickly stopped talking and laughed at the researcher. Sometime if learners wanted clarification from their teachers on what they were supposed to do, learners spoke in Chitumbuka for instance, “*Sir, page uli? Nambala vichi?*” (Sir what page? Which number?). All these were evident in the lesson introduction, during drilling of examples, when learners were writing exercises especially in groups and during lesson conclusion.

b. In subtraction of money

In the process of teaching and learning subtraction of money, the teachers mostly used English mixed with Chitumbuka. In the introduction of lesson, T1 wrote a word problem on the chalkboard; take away 9 from 11. The teacher asked learners to come in front and work out the word problem. The whole class was quiet until the teacher said in Chitumbuka. “*Ndinjani wazi kunthazi waza kalemba ntchito iyo ili pa bolodi?*”(Who should come in front and write the work that is on the chalkboard?). As an example also on subtraction of money, T2 worked out the following word problem on chalkboard with learners; “A carpenter had K92415 75t. He bought timber for K68587 84t. How much money was left?” The teacher explained everything in English except when he wanted to explain where regrouping was involved if a smaller number failed to subtract a bigger one. The teacher explained in Chitumbuka mixed with English in the following way; “7-8= *apa(here) it can’t sono tikutola one uyu kufuma pa uniti ya kwacha pala yafika kumatambala wakupanga vinthu* (now we regroup this one from the units of kwacha and when we put under tambala it makes)hundred then we subtract.” Furthermore the teachers used Chitumbuka when they were going round marking individual learners’

work on the exercise given. That was evident when one learner from S2 had failed to work out the word problem correctly. The teacher was heard murmuring some Chitumbuka words, “*apa chikulu niichi ndicho nyengo zose chiushenge chichoko.*” (Here the larger number is this one; always it should subtract the smaller number)

On the part of learners, they were mostly discussing everything in Chitumbuka whenever assigned work in groups and or in pairs. When they wanted to ask questions for clarifications learners mostly used Chitumbuka. Whenever the teachers had asked them a question, they responded in a single English word or a phrase such as ‘no’; ‘yes’; ‘don’t know’.

c. In multiplication of money

Just the same with other two mathematics operations discussed above, the teacher mostly alternated between English and Chitumbuka in the process of teaching and learning multiplication of money however English was used to the larger extent than Chitumbuka. English dominated much during introduction of the lesson and when drilling examples. The teachers’ explanations were basically in English with a mixture of a word or a phrase in Chitumbuka especially when giving instructions to learners about an activity to do or when disciplining learners such as *khalani chete ninyengo yamasamu* (be quiet, it’s time for mathematics). Learners’ discussions in groups were also conducted in Chitumbuka as in other operations above.

d. In division of money

In division of money the teachers mostly used English as language of instruction to a large extent throughout the lesson with insertion of some Chitumbuka words and short phrases within some English sentences for instance during introduction of the lesson T2 was quoted as saying “There is need to divide a bigger number *nanambala ichoko*(by a small number) for instance in this word problem share equally K48360 among 4 girls; *nambala ichoko ndi 4 sono* (small number is 4 therefore) divide 4 into K48360.” At another instance T1 asked learners to sit in groups of three learners but most learners did not understand the instruction from their teacher and were just quite until other learners started translating what the teacher had said in Chitumbuka “*Ati tikhale watatuwatatu.*”(Let’s be in threes). In lesson introduction while the teachers were working out examples and then assigned learners an activity, the teachers were communicating mainly in English mixed with some Chitumbuka words and phrases such as “Which number *inganjila apa* (can go into this one) without a remainder?” Sometimes, if learners wanted a clarification from the teachers about the exercise given they simply asked in Chitumbuka for instance, “Sir *nambala 4?*”(number 4?). At one point in time T2 gave learners the following word problems; “Watipaso wanted to buy pens and he had K600.00 in his pocket. The cost of one pen was K100.00. How many pens did he buy?” More than half of the class simply responded in Chitumbuka, “*Kwali, nkhumanya yaye or nkhopulika yaye.*” (I am not sure, I don’t know, I don’t get you).The teacher then translated the whole word problem into Chitumbuka as follow; “*Watipaso wakhumbanga kugula mapenisulo ndipo wakawa nandalama zakukwana K600.00.Mtengo wapenisulo limoza ukawa K100.00. Kasi wakagula mapenisulo yalinga?*” (Watipaso wanted to buy

pens and he had K600.00 in his pocket. The cost of one pen was K100.00. How many pens did he buy?). At that juncture almost each and every learner worked out the above word problem correctly. Learners sometimes were observed responding to questions in short poor grammatical English sentences for instances, “How many pencils were there according to the word problem?” most learners from S2 simply responded, “were there six pencils.” and “How many times eight goes into four?” learners simply answered, “Can’t or *Chikukana*. ” (It can’t).

4.1.3 Common language problems

a) In addition of money

During lesson observation, it was noted that learners were failing to read money correctly from figures to words as in the following word problem; Add K13200 45t and K20000 16t. K13200 45t was read as thirteen thousand and twenty kwacha forty five tambala by most learners from both schools. Likewise K20000 16t was read as two thousand kwacha and sixteen tambala.

Secondly it was also noted that some English words were poorly pronounced; that was observed when the teacher asked learners to read the following word problem; Mrs. Kunje received K41750 50t from house rent and K37000 13t from maize sales. How much money did she receive? The following words were poorly pronounced; rent as rint and receive as resevu.

Other general language problems observed were as follow;

- Writing poor spelling when asked to copy down the word problem for instance dd for did, rceive for receive, alltogether for altogether

- Writing incomplete statements when asked to copy down word problems such as; Shadreck bought a cupboard at K25800.13 and a sofa set at K14050.29. How much did she?
- Poor grammar when asked to copy down the word problem such as “how much money did she received?” “How much money did I spent?”
- Writing down English sentences with words not separated as if they were writing an email
address;mrskunnjereceivedk47750fromhouserentandk67345fromsales.howmuchmoneydidshereceivealtogether?
- Starting writing names of people with small letters such as john, mrs kunje, miss kadzuwa.
- Literal translation of word when asked by the teacher to give the meaning of such words for instance when learners were asked to give the meaning of the phrase “add together” most of them said that add together means sazga vose pamodza.
- Splitting of some English words found in a word problem unnecessarily as in the following examples; al to gether, ex ceed, re ceive.
- Starting writing each and every word in word problem with a capital letter when asked to copy down: My Father Bought a Motor Bike At K75800.18 And A Refrigerator At K19200.24. How Much Did He Pay Altogether?

During lesson observation of addition of money, it was also noted that most learners were failing to identify cue words and short phrases that indicated addition of money. The teacher started working out each word problem by asking learners to read the whole word problem and later identified a cue word or words in each and every word problem for

instance; Miss Kadzuwa spent K16400 on chicken feeds, K20500 69t on cattle feeds and K13000 22t on pig feeds. How much money did she spend altogether? After reading the teacher asked learners to identify the cue words to indicate that the word problem required addition of money. It was observed that even after being instructed earlier on, most learners failed to identify cue words ‘spend altogether’ that indicated addition instead learners were reading the whole problem. Other learners mentioned words such as ‘spend’, ‘feeds’, ‘much’, ‘how’ and ‘did’ that they meant addition of money.

b) In subtraction of money

It was noted during lesson observation of subtraction of money that some English words found in the word problems were also poorly pronounced; For instance the teacher asked learners to read the following word problem as a class; a deep freezer was sold at thirty seven thousands nine hundred and fifty kwacha. If I had thirty thousand five hundred kwacha, how much more money was needed to needed to buy the deep freezer? Most learners pronounced the word deep freezer as depufreza.

Furthermore it was also noted that some numbers written in figures found in some word problems were also read wrongly by most learners such as; find the difference between K48450 and K79695. Most learners read the numbers as forty eight thousand and four fifty; seventy nine thousand and six ninety five respectively.

It was noted again from lesson observation that most learners failed to understand the meaning of the concepts such as ‘finding the difference, take away and how much more. As a result learners subtracted a bigger number from a smaller one. Below are examples where learners subtracted a bigger number from a smaller one:

1. Find the difference between K42250 and K73250
2. Take away K30500 from K61600
3. Masada had K45789 in her pocket and she wanted to buy a radio worth K57834. How much more is required

During lesson observation of subtraction of money, it was again noted that in the following word problem; a deep freezer was sold at thirty seven thousands nine hundred and fifty kwacha. If I had thirty thousand five hundred kwacha, how much more money was needed to buy the deep freezer? Learners had problems in writing money from words to figures. Thirty seven thousand nine hundred and fifty kwacha was written as K3790050 and thirty thousand five hundred kwacha was written as K30000500 by most learners.

Furthermore it was also observed that learners were failing to write a mathematical statement from a word problem as evident in the following example during lesson introduction; take away 9 from 11 right away from the introduction. Most learners just produced the answer 2 without actually explaining what was involved when asked by the teacher to do so.

c) In multiplication of money

It was further observed in multiplication of money that learners were reading some words found in a word problem with poor pronunciations such as resevu for receive, sold for said and win for won.

It was further observed that if the multipliers were written in words in the word problems, learners had difficulties writing them in figures when working out the word problem as in the case with the following word problems given to learners;

- i. Seven primary schools won zonal trophies. If each school was given K6900. Find the total amount of money paid to the seven schools?
- ii. The cost of building one small bridge is K99800 each. Find the cost of building eight bridges

In both word problems indicated above, most learners had difficulties in putting the multipliers seven and eight respectively in figures. Most of the learners wrote 70 and 80 respectively. Learners find it easier to work out word problems where the multipliers were written in figures such as; a football player received K34278 each week. How much did he receive in 7 weeks?

d) In division of money

Learners had difficulties in reading some English vocabularies found in these word problems;

- I. Share equally K48360 among four girls
- II. K46580 was paid to a worker in a year. How much did the worker receive in a month?

The following words were poorly pronounced; receive was read as resevu, share was read as shed, equally was read as equle or akwale, among was read as amongu and worker was read as woku.

During lesson observation of division of money, it was clear that most learners faced challenges in reading the English word problems assigned by the teacher to read before actual working out the word problems. A lot of time was spent in reading the sentences

since learners were reading word by word. It was observed that most learners had problem in reading the following word problem; K86580 was paid to a worker in a year. How much did the worker receive in each month?

It was also noted that teachers constantly reminded learners key words or phrases that indicated that the operation to be used was division such as; share equally, total-each, divide, cost of each and quotient. Each time the teachers asked learners to identify the words or phrases in a word problems, they were able to do so however on the other hand if the teacher identified a word and asked learners to explain the meaning of the word, the whole class was quiet.

4.1.4 Misconceptions and errors

Misconceptions and errors observed were of two types; the ones that were general to mathematics and the other ones that were directly connected to language of instruction.

4.1.4.1 General misconceptions and errors

Most of the misconceptions and errors were as a result of computations as evident in the information below collected from lesson observations. Learners used a correct operation and procedure but incorrect final answer or the learner used a correct operation but wrong procedure or method.

i. In addition of money

During lesson observation of addition of money, a number of misconceptions and errors were observed in the following word problem which was given to learners as an exercise; Kapaza school received K25200 48t, K12000 and K60500 30t from three different people. How much did the school receive altogether?

- Learners were setting numbers poorly after reading the word problem as below

K	t
25200	48
+ 12000	30
60500	00

205700	78

- Learners were considering zeros as valueless when they were put at the tens and ones units of the number as evident in the example below.

K	t
25200	48
+ 12000	30
60500	00

977	78

Furthermore it was also learnt from lesson observation that learners were failing to regroup or alternatively were regrouping where they were not supposed to regroup money when adding figures picked from word problems such as from examples written below respectively;

- Mr. Kazuwa spent K16400 on chicken feeds, K20500 69t on cattle feeds and K13000 22t on pig feeds. How much money did he spend altogether?

K	t
16400	00
+ 20500	69
13000	22

49900	811

- Mrs. Kunje received K41750 50t from house rent and K37000 13t from maize sales. How much money did she receive?

➤

K	t
41750	50
+ 37000	13

79750	73

It was also discovered from lesson observation that some learners were adding money starting with left hand side column (kwachas) first and ending up with tambalas as in example below;

- I bought a cupboard at K25800 16t and a double bed at K16300 19t. How much money did I spend?

K	t
25800	16
+ 16300	19

31210	215

Furthermore it was also noted that some learners were failing to write correct place values of numbers when written in words as evident in the example that follows;

- Kondwani sold a video screen for twenty seven thousand and fifty kwacha fifty nine tambala and a radio for fourteen thousand fifty kwacha nineteen tambala. How much money did he get from the sales?

K	t
2750	59
+ 1450	19

420	78

- Mr. Phiri paid John K15800 10t and Rajab K1345. How much money did he spend?

K	t
15800	10
+ 13	45
28800	55

It was also noted that some learners had a wrong concept about how many numbers are involved in addition of money, learners thought that in addition of money involving word problems, only two numbers are added. If there were three numbers in a word problem, learner picked the first two numbers only and added as in example below;

- Alice bought a cell phone at K17950, a sofa set at K37275 and a deep freezer at K29680.

Find the total cost of the items

	K	t
	17950	00
+	37275	00
	45225	00

It was also revealed that some learners had wrong concept about the addition of number zero with another zero as in the following word problem which was given as an exercise to learners; Mrs. Kunje received K41750 50t from house rent and K37000 13t from maize sales. How much money did she receive? Most learners thought that when the number zero is added with another number zero they do not give any answer as in example below taken from learners' work.

	K	t
	41750	50
+	37000	13

	7875	63

Furthermore lesson observation revealed that some learners were combining decimal point with short form of tambala (t) as evident in the following word problem; a tobacco farmer paid K13218.00 for seeds, K38100.65 for fertilizer and K20585.25 for a bag of fertilizer. How much did she spend?

	K	t
	13218.	00
+	38100.	65
	20585.	25

ii. In multiplication of money

Most learners were able to identify the multiplier and the multiplicand when written in figures in each word problem when asked to work out either in groups or pairs however misconceptions and errors were observed in the actual calculations such as from word problems below;

- 7 primary schools won zonal trophies. If each school was given K6900, find the total amount of money paid to the seven schools?

K	t
6900	00
×	7

48377	77

iii. In division of money

From what was observed almost each and every learner was able to identify an operation as division on their own after silently reading each word problem such as;

1. Mapale primary school won K75872 in a competition. The money was shared equally among eight classes. How much did each class get?
2. Share equally K48360 among four girls
3. The cost for six chairs was K14772. Find the cost of each chair?

In each case almost each and every learner was in a position to mention the dividend and the divisor in each case. However the majority of the learners were unable to actually work out the actual division and arrive at the correct answers. At that point it was where some errors were observed such as;

1. $K75872 \div 80 = 9484$
2. $K48360 \div 4 = 12390$
3. $K14772 \div 60 = 2482$

4.1.4.2 Misconception and errors connected directly to language of instruction

I. In subtraction of money

The researcher observed that most learners failed to identify subtrahend and minuend in word problems. This was evident in some word problems which started with a smaller number. Almost each and every learner just considered the first digit to appear as subtrahend without considering their values; learners worked out such word problems by writing a smaller number first on top. Others found the correct answers while others

got wrong answers because they just subtracted a smaller number from a bigger one without considering whether the number was a subtrahend or minuend as evident below:

- Subtract K48450 from K79695

K	t	K	t
48750	00	48750	00
-79695	00	- 79695	00
-----		-----	
20945	00	31145	00
-----		-----	

- Take away K39500 from K61600

K	t	K	t
39500	00	39500	00
- 61600	00	- 61600	00
-----		-----	
22100	00	38100	00
-----		-----	

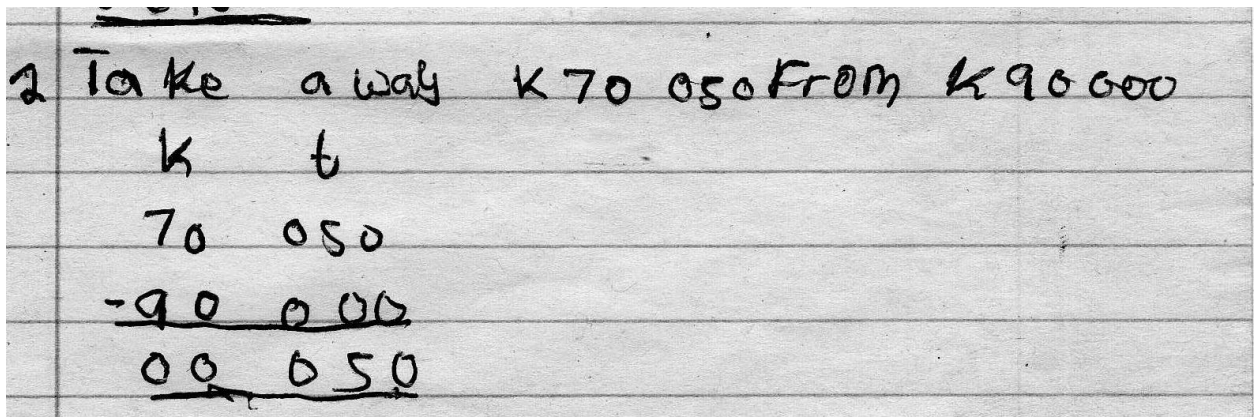
- A school bought a computer worthy K19900 00t. How much money was left from K20000 00t.

K	t	K	t
19900	00	19900	00
-20000	00	- 20000	00
-----		-----	
00100	00	19900	00
-----		-----	

Mr. Mpezeni had K60950 00t. He wanted to buy land which was being sold at K90000 00t. How much more money is needed in order to buy the land?

K	t	K	t	K	t
60950	00	60950	00	60950	00
-90000	00	- 90000	00	- 90000	00
-----		-----		-----	
30950	00	30000	00	00950	00
-----		-----		-----	

Below is an example from learner's script. In the script below just the same as in example above, learners thought that when a smaller number subtract a larger number then the solution is zero.



II. In multiplication of money

If the multiplier is written in words as in above examples most learners thought that there was no multiplier hence could multiply by zero such as;

- If each school was given K6900.00, find the total amount of money paid to the six schools?

K	t
6900	00
×	0

6900	00

Sometime learners were multiplying with whichever number that appeared in a word problem with little consideration whether it was multiplier and multiplicand or not. That was evident in the following word problems of this nature:

- 11 football players received K69890 14t each week. How much did they receive in 5 weeks?

K	t
69890	14
×	11

768791	54

4.1.5 Overcoming common language problems, misconceptions and errors

A. In addition of money

Data collected from lesson observation revealed that the teachers constantly gave learners some cue or key words and phrases that once found in a word problem they meant addition of money. The cue words and phrases were drilled before the teachers started working out an example with learners. These were sum of, altogether, added to, together make, plus, increased by, more than, total of. The teachers wrote a list of these cue words on a chart paper with examples of simple sentences from everyday life and posted on the chalkboard well in advance before the lesson started. Learners were asked to read first all the words and later discussed the meanings in their groups as used in the sentences. When

a mathematical meaning needed to be differentiated from everyday meaning, the teachers then discussed with learners the different meanings. An example was where the T1 wrote two sentences on the word “sum’ to show the two different meanings as follow; the sum of K20 and K10 is K30 and sum is a clever boy. As a way of ensuring that learners have understood a particular word problem, the teachers were asking learners to read word problems several times before they actually started working the word problems out.

B. In subtraction of money

Likewise in subtraction of money, it was also observed that the teachers drilled some cue words and phrases that meant subtraction such as; more than, combined, difference, take away, minus, less than, fewer than and decreased by. In addition to that the teachers continually advised learners that in a word problem involving subtraction, they should always consider a large number as a subtrahend.

C. In multiplication of money

The researcher observed that the teachers went on advising learners that the multiplier was a smaller number for instance; a carpenter sold 8 beds at K9685 each. Find the total cost of 8 beds? Here the T2 explained that 8 is a smaller number therefore it was the multiplier. In addition to that, the teacher drilled some words and phrases which indicated that the word problem required multiplication such as: total cost, product of and multiplied by.

D. In division of money

Likewise in division of money, it was also learnt that that key words and phrases were constantly given and defined by the teachers to indicate that the word problem required division operation such as; total-each, share equally, divide, quotient, cost of each, receive in each, get, find cost of monthly or weekly or yearly--and price of each.

4.2 Findings from interviews with mathematics teachers

4.2.1 Background information

Participants were asked about their age and teaching experience. The table below indicates the background information on analysis of data collected from standard 5 mathematics teachers before the actual interview commenced.

Table 3: Background information for mathematics teachers' interviews

Teacher	Sex	Age	Teaching experience	Date of interview	Time
T1	M	50	17	8.2.2016	3.00-4.00pm
T2	M	40	22	8.2.2016	7.00-8.00am

4.2.2 Language of instruction used

From what was collected from interview with both mathematics teachers pertaining to the language of instruction in standard five, it was learnt that English was generally used to a larger extent as a language of learning and teaching in standard five during mathematics lessons with a little of Chitumbuka in other circumstances. The following reasons were cited as to why English was generally used. The first reason was that the teachers wanted to respect the language of instruction policy in Malawi which stipulates that English should be used as a language of learning and teaching (LOLT) mathematics from

standard five onwards. The teachers further explained that in order to be at par with other primary schools in Malawi there was need to strictly abide by the said policy. The other reason given by the mathematics teachers was that it was important to use English as LOLT since learners' books as well as teacher's guide for mathematics in standard 5 are both written in English. Furthermore, the other reason mentioned by the mathematics teachers was that it was important to teach in English in order to prepare learners in advance for MANEB examinations which are conducted in English. It was further argued by both mathematics teachers that there was need for learners to learn mathematics in English since it was high time that learners started learning mathematics in their first language, Chitumbuka. Further, the mathematics teachers explained their views on the language of instruction policy in Malawi. The mathematics teachers observed that it is good that English is used as LOLT from standard 5 but preferred that English would have started right away in standard three as a language of instruction in mathematics. The teachers strongly agreed that English should really be used in standard five during mathematics lessons since the learners were coming from using Chitumbuka as a LOLT from standards 1-4. On the other hand the teachers agreed that learners were allowed at times to use their native language, Chitumbuka during mathematics lessons. T1 argued, "you know sir, we cannot completely run away from our native language when teaching learners who also speak that language, even in our parliament legislators sometimes switched on to their native languages." According to T1, the use of first language was essential when learners did not clearly understand the new concept. The following example was spotted by the teacher from the word problem that involved subtraction of money; Mr. Mpezeni had K60950.00. He wanted to buy land which was being sold

K90000.00. How much more money was needed in order to buy the land. T1 argued that the word problem of that nature needed the teacher to explain the sense of the word problem in Chitumbuka by among other things explaining what it meant by ‘how much more money’ in Chitumbuka as “*Ndalama zikulutilapo zilinga?*” Both teachers went on advising that the use of Chitumbuka was necessary when clarifying some key vocabularies and short phrases that appeared in word problems such as sum, exceed, difference, take away, left, how much more, pay for all, each receive, cost of each and share equally. Finally it was also argued that the use of Chitumbuka was obvious in circumstances where instructions from teacher to learner were not clear for instance; take away K240 from K390. The teacher said that it was necessary to interpret the phrase ‘take away’ into Chitumbuka ‘*tifumiskeko*’ since most learners got it wrong. In a summary, both teachers advised that Chitumbuka was frequently used in the following circumstances; in explaining new concepts or vocabulary, in giving instructions to learners and during group or pair work activities by learners.

4.2.3 Common language problems

It was revealed from both teachers that most learners failed to read correctly some English words in English word problems such as resevu for receive, sold for said and win for won.

It was further noted from interview with T2 that learners had difficulties in reading and writing money that were written in words such as; Chisomo spent ninety three thousand four hundred and sixty kwacha for 18 trips to Tanzania. Find the cost of each trip? The teacher observed that at one time most learners in his class read and wrote the amount in

figures as K9300040060. Another example from T1 was; find the cost of 18 desks if the cost of each desk was three thousand and two hundred kwacha. ‘Most learners read the amount given as K3000200.00.’ advised the teacher with regrets.

The findings from T1 further revealed that most learners failed to interpret the meaning of some key words found in word problems especially when all the four operations were mixed such as take away, sum of, product of, what should be added. The teacher gave an example of the following word problems which required subtraction but most learners added since they did not understand the meaning of cue words take away, difference and exceed;

- I. Take away K83001.00 from K101000.00
- II. What is the difference between K49873.21 and K59985.68
- III. By how much does K8951.00 exceed K6495.87

Both mathematics teachers observed that as a result of the above mentioned problems, learners failed to interpret the English word problems and consequently failed to work out the word problem and consequently arrived at the wrong answers. The two mathematics teachers further explained that sometimes learners did not understand the English language expressed in word problems as a result they misplaced the operations especially when all the arithmetic operations were tested at the same time.

The findings from interview with T2 clearly indicated that learners were also confused with use of some mathematical terms with precise meaning in mathematics but also in everyday life for instances difference, sum and total cost.

Furthermore the mathematics teachers explained that completely use of some unfamiliar or new English words found in some word problems was a great source of confusion that is difficulties in learning mathematics vocabularies found in word problems that involved basic operations of money in standard five.

During interview with teacher 2, it was also explained that learners had difficulties in writing numbers from words to figures such as in above example given by teacher. The teacher further explained that learners were writing incorrect spelling of some amount of money written in words for instance; sixty was written as sixty, seventy was written as seventeeny and ninety was written as niney.

4.2.4 Misconceptions and errors

The findings gathered from the mathematics teachers during interview showed that most learners arrived at wrong answers due to miscalculations of operations or due to carelessness when working out English word problems. In addition the teacher said that there was also a tendency of writing incorrect place values of numbers especially when learners wanted to write the number from words to figures. Furthermore, most learners failed to identify which number was bigger and which one was smaller especially in word problems that required subtraction.

Analysis of data collected from interview with mathematics teachers revealed that most learners regarded the last two digits as representing the tambalas in a word problem involving addition or subtraction of money in kwacha only for instance;

Mr. Mpezeni had K60950. He wanted to buy land which was being sold at K90000. How much more money is needed in order to buy the land?

T1 observed that most learners worked out the above word problem as follow;

$$K609\ 50t - K900\ 00t = K291\ 00t \text{ or } K609\ 00t - K900\ 00t = K309\ 00t$$

Furthermore, teachers observed that in a word problem where there was need for a smaller number to subtract a larger number the solution given by learners was either zero or the larger number itself for instances; take away K60950 from K90000. According to the teachers most learners worked it out as follows to arrive at two different wrong answers;

K		t	or	K		t
60950		00		60950		00
-90000		00	-	90000		00
00950		00		90950		00

Findings from interview with mathematics teachers further showed that in most cases learners looked at mathematics word problems as tough which involved reading long sentences. It was later learned that most learners were just subtracting a large amount of money from a smaller one just because the smaller amount of money appears first in the word problem sentence for instance;

- a. Take away K56328 from K78456
- b. What is the difference between K23418 and K63592

According to T1 in the above instances majority of the learners worked out the word problems as stated below where they were just subtracting a smaller number from a large one without considering the position of minuend and subtrahend;

- a. $K56328 - K78456 = K22132$
- b. $K23418 - K63592 = K40186$

It was further learnt from mathematics teachers that most learners were adding instead of subtracting and multiplying instead of dividing and vice versa respectively without actually understanding what the word problem was demanding them to find. According to the teachers this resulted in learners failing to identify and apply accordingly key words or short phrases in a particular word problem which could be a guide to what operation to choose for instances sum, difference and take away.

Furthermore, data collected from interview with T2 indicated that the word “total” was often regarded as it meant addition by most learners. The mathematics teacher discovered that whenever learners came across the word ‘total’ in a word problem that required multiplication of money, learners were adding as in the following example recited by the teacher; the cost of building one bridge is K9995 each. Find the total cost of building eight bridges. Most learners worked it out as:

K	t
9995	00
+	8

9995	8

Furthermore, the mathematics teachers observed that whenever all the four mathematics operations were tested in one exercise, learners felt that the first word problem involved addition and the last one involved division of money thus according to the order they were covered in class. T2 recited an example of a weekend test administered to learners where all the four mathematics operations were tested. The teacher explained that the test had five items where the following first item required learners to divide money; Mrs. Chizwazwa wanted to share equally K34528 47t to her seven children. How much did each receive? Furthermore the teacher said that she was really surprised to observe that more than half of the class decided to add. When the teacher asked his learners why they decided to choose addition of money in the first item, they all answered in Chitumbuka '*yakwamba*.' (First one) It was further learnt that most learners thought that in addition or multiplication of say five digit numbers the solution should also end in five digit number even though regrouping had been involved for instance:

- Chanjo had K35270 in her pocket and Chitemwa had K76211. How much money did they have altogether? Most learners worked it out as follow;

K	t
35270	00
+ 76211	00

11481	00

4.2.5 Overcoming such language problem, misconceptions and errors

Data analysed from interview with both mathematics teachers revealed that there was need to use simpler English vocabularies when working out word problems in the initial stage with learners who were just starting using English as a language of instruction in mathematics such as add, subtract, multiply and divide. The teachers further said that this did not mean that they should use long or complicated words but they should use words accurately and consistently in meaningful situations. T2 cited the following example; “I have K23567 and I add K67345. How much money do I have now?” The teacher observed that the use of English words such as sum of , exceed, share equally, how much more, how much was left and cost of each just to mention but a few were adding pains to the already existing wounds. Data collected from teachers continually indicated that at initial stage to start using English as a language of instruction in standard five, there was need to use alternative words or phrases to replace some misleading words such as sum of should be replaced by add; how much more to be replaced by subtract; take away and difference should be replaced by subtract and share equally should be replaced by divide.

Later on the mathematics teachers proposed that there was need to develop a mathematical register. Learners should study or be taught mathematics vocabulary in basic operation of money. The teacher should write down all the cue words and phrases in basic operation of money on a chart paper and paste it on the classroom board for learners to study well in advance before the words are used during normal classroom lessons.

The teachers went on advising that learners should be taught to identify words or phrases in a word problem which involved addition, subtraction, multiplication or division of money. T1 referred to that as cue word strategy that is searching for a word or phrases in a word problem statement that would give learners a hint of which operation to choose such words and short phrases as sum of, difference and share equally would be used to add, subtract and divide respectively.

The teachers went on arguing that there was need to promote discussion in mathematics lessons with proper direction from the teacher. Among other things the teachers advised that learners should be given more reading practices on word problems. The learners should be given enough time to read the word problem before they started solving them. T2 emphasized that he did not care if the whole lesson ended up with learners just reading the word problems then in the second lesson it's when they started solving.

The teachers cited out that English language should be used as a language of instruction in all learning areas except in Chichewa lessons right away from standard one so that learners should get familiar with the English language well in advance. Both teachers further advised that there is need for mathematics teachers to contact language teachers to discuss their common language problems. This was what T1 referred to as an integrated approach to teaching mathematics. The teacher indicated that there was need to promote an 'Integrated Approach' to teaching and learning of mathematics in primary school. T1 went on advising that mathematics teachers need to contact language teachers to discuss their common language problems or a discussion between different teachers of the vocabulary that they were using might help to prevent different names being used for the

same concept or the misuse of mathematical terminology by other teachers. In this approach the teacher suggested that there was need to arrange with the language teacher to cover with learners all the cue words that are found in ‘basic operation of money.’

The teacher further added by arguing that there was also need to promote bilingualism in the teaching of word problems activities in mathematics right away from standard three where Chichewa word problem are introduced.

As one way of assisting learners to overcome language problems, misconceptions and errors, the teachers indicated that they used a shopping scene when introducing each basic operation of money. The teachers explained that a shopping scene is role play in real life situation where learners practice buying and selling as in the example given below: Chimwemwe bought a bicycle at K27653. Alinafe also bought a bicycle at K34612. How much money did them both spent altogether?

The following procedure was suggested by T2;

1. Set up a shopping corner where two bicycles are displayed with price tags
2. Ask two learners to a shopkeeper and the other one to be a customer
3. Ask the first customer to buy a bicycle which costs K27653
4. Ask the second customer to buy another bicycle which costs K34612
5. Ask the shopkeepers to find the total amount spent by both customers
6. Help learners to establish that $K27653 + K34612 = K62265$
7. Give learners more problems for practices.

The mathematics teacher went on explaining that in the process of buying and selling the following questions should be asked by;

- What did you buy?
- How much did it cost?
- How much did you give to the shopkeeper?
- How much did you both spend?
- What did you do to find the total?

The teacher finally concluded that the shopping scene could also be used in teaching word problems that involved subtraction, multiplication and division of money.

Finally the teachers advised that learners should be allowed to use their Chitumbuka language when they wanted clarifications from their teachers

4.3 Findings from interviews with learners

4.3.1 Background information

The analysis of data from interview with learners revealed the following information recorded in the table below.

Table 4: Background information for interview with learners

School	Class	No. of Learners		Date of interview	Time of interview
		M	F		
S1	Standard 5	5	5	5.2.2016	3.00- 4.00pm
S2	Standard 5	5	5	5.2.2016	7.00- 8.00am

4.3.2 Language of instruction used

It was learnt from learners with great interest that in most cases their mathematics teachers used English to a larger extent as a language of learning and teaching mathematics with some of interpretations into Chitumbuka. Most learners explained that Chitumbuka was mainly used in situations where a teacher wanted to clarify a concept that learners had not understood. Other circumstances mentioned by almost each and every learner were; When stressing a point on instructions about activity learners were going to carry out either as an individual or as a group, when going round marking learners work, the teachers were making corrections in Chitumbuka for any word problem that learners got it wrong and whenever the teacher was emotional or when wanted to discipline some learners that were making noise, the language used was Chitumbuka.

However, some learners observed that whenever there was someone behind observing a lesson, the teacher used English as a LOLT throughout the lesson. Learners said that at that point in time the teacher could shout ‘English please’ at any learner responding to teacher’s questions in Chitumbuka.

According to the learners, the teachers allowed them to respond in Chitumbuka only in the absence of supervisors or any visitor observing the lessons. Learners preferred English to be used as a language of learning and teaching in mathematics in standard five. The analysis of information from interview with learners revealed the following reasons as recorded in the table below;

Table 5: Summary of analysis of learners’ reasons for using English as LOLT

Responses	No. of learners: (n= 10)	
	S1	S2
We want to know English	10	10
We want to be educated	8	7
We want job	10	10
We want to pass mathematics in standard eight	4	5
We want to speak English with visitors	9	9

As it can be noted from the summary in the table, all ten learners interviewed preferred English to be used as language of learning and teaching and cited reasons as recorded in table above.

4.3.3 Common language problems

All learners interviewed accepted that they had been working mathematics involving word problems ever since they entered standard five in each and every topic after learning non-verbal mathematics. It was further learnt that learners started working out mathematics involving word problems way back in standard three but that time the word problems were in Chichewa and the language of instruction was Chitumbuka. Regardless working with word problems since standard three, learners accepted that the following were language problems faced with word problems that were in English as evident from the analysis of data as recorded in tables below for school 1 and school 2

Table 6: Summary of analysis of common language problems mentioned by learners

Responses	Learners: (n=10)	
	S1	S2
Difficulties in writing quantity of money from words to numbers	10	8
Difficulties in reading some long English word problems which at the end of the day confuse them	8	6
Difficulties in reading numbers found in word problems especially when they are written in words	7	8
Difficulties in identifying an operation to choose after reading a particular word problem when all four mathematics operation are tested	8	10

4.3.4 Overcoming language problems

Learners were later asked to suggest strategies that would assist to overcome some common language problems that were faced with English word problem. The table below gives a summary of analysis of information from twenty learners' responses on ways of overcoming common language problems, misconceptions and errors.

Table 7: Summary of analysis of strategies mentioned by learners for overcoming language

Responses by learners	Learners;(n=10)	
	S1	S2
Having extra hours in addition to the normal teaching hours	9	8
Assisting one another in solving word problems	8	8
The teacher should read first the word problem before learners start to solve	10	10
The teacher should first of interpret the word problems into Chitumbuka before learners started working	8	8
Teachers to use relevant resources when teaching word problems such as drawings and picture	3	5
Teachers should encourage learners to develop a reading culture of English books	9	9
There is need to have enough text books in mathematics in standard five so that each learner should have enough time to read and practise a particular word problem rather than scrambling on one book.	10	7
Teachers should always give learners homework on word problems	9	10

4.4 Findings from learners test

4.4.1 Background information

The table below shows the analysis of information gathered by the researcher before the commencement of the learners' test.

Table 8: Background information for learners' test

School	Class	No. of Learners		Date of Test
		M	F	
S1	Standard 5	10	10	7.2.2016
S2	Standard 5	8	12	7.2.2016

4.4.2 Summary of items identification

The frequencies of identifying a correct mathematics operation; incorrect mathematics operation due to language problems, misconceptions and errors; and final incorrect answer due to misconceptions and computational errors were noted for each test item and are presented in the table below for both schools:

Table 9: summary of identification of items per number of learners

Test items	No. of Learners identifying correct operation			No. of learners identifying incorrect operation			No. of Learners working out correct answer		
	S1	S2	TOTAL	S1	S2	TOTAL	S1	S2	TOTAL
1	6	12	18	14	8	22	1	6	7
2	15	16	31	5	4	9	7	9	16
3	10	9	19	10	11	21	5	5	10
4	14	14	28	6	6	12	None	None	None

4.4.3 Common language problems

The information below gives some common language problems that were depicted from results of the learners' test that was administered at the end topic 'Basic operation of money.' The common language problems in this section are presented as per item. The section has also included some scanned work from some selected learners' scripts

Item 1: Mr. Mpezeni had K60950. He wanted to buy land which was being sold at K90000. How much more money is needed in order to buy the land?

Most learners were confused with the word phrase 'how much more' as used to compare two amount of money. This clearly demonstrated that some learners did not understand the meaning of the term 'how much more' to mean subtraction hence they identified addition as evident in the scanned work from two learners' scripts below:

1. Mr. Mpezeni had K60950. He wanted to buy land which was being sold at K90000. How much more money is needed in order to buy the land?

$$\begin{array}{r} \text{K} \\ 60950 \\ + 90000 \\ \hline 150950 \end{array}$$

1. Mr. Mpezeni had K60950. He wanted to buy land which was being sold at K90000. How much more money is needed in order to buy the land?

$$\begin{array}{r} \text{K} \\ 60950 \\ + 90000 \\ \hline 50950 \end{array}$$

Item 2: The cost of one chair for the school is K5865. How much will it be paid for six chairs?

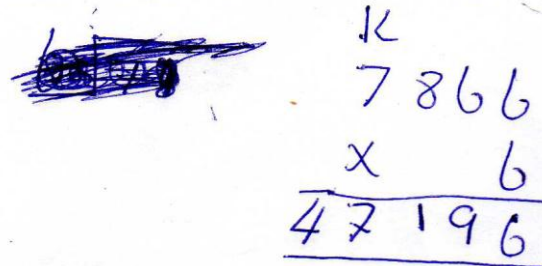
Information from data analysis of test showed that some learners were writing number six from word to figure incorrectly as 16 and some learners failed to understand the meaning of 'how much---- for six chairs?' to mean multiplication of money. This resulted in learners choosing an incorrect operation 'division of money'

Item 3: six pencils were bought by Chisomo at a price of K7866. What was the cost of each pencil?

In this item, the researcher observed that most learners had difficulties in understanding the meaning of cue short phrase 'cost of each' that it meant multiplication. In other words learners did not understand the meaning of the word phrase 'cost of each.' Learners felt

that it meant multiplication as in the scanned work below taken from one of the learners' scripts:

3. Six pencils were bought by Chisomo at a price of K7866. What was the cost of each pencil?


$$\begin{array}{r} \text{K} \\ 7866 \\ \times \quad 6 \\ \hline 47196 \end{array}$$

Item 4: Mr. Kayuni has goods worth five thousand seven hundred and twenty two kwacha seventy tambala. Mrs. Kayuni also has goods worth thirty thousand one hundred and twelve kwacha fifteen tambala. Find the total sum of money for goods Mr. and Mrs. Kayuni have?

Data analysis from test showed that some learners failed to write the given numbers from words to figures for instances the first addend was written as; K5000700 70t; K5000722 70t; K57202 70t. The second addend was written as K300010012 15t. In addition to that, some learners were splitting the first addend into several figures when reading it from words to figures and later added. Furthermore some learners failed to understand that 'sum of' means addition hence instead of adding, some subtracted as evident in most of the learners scripts

4.4.4 Misconceptions and errors

The information collected from analysis of learners' misconceptions and errors in the learners test are also presented in this section per item with a support from some scanned work in some learners' scripts.

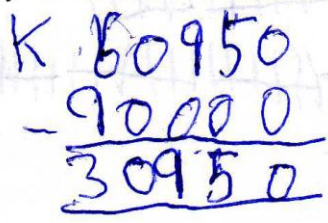
Item 1: Mr. Mpezeni had K60950. He wanted to buy land which was being sold at K90000. How much more money is needed in order to buy the land?

Data analysed from test indicated that most learners had a wrong concept with subtraction of money involving zero digit where they felt that any number subtracted from zero the solution is the number itself as in this example from learners work; $K90000 - K60950 = K30950$.

It was also learnt that learners had an alternative concept with subtraction involving word problems where they considered the first number to appear in a word problem as a subtrahend as in examples below taken from one learner's script and another learner's scanned work

- i. $K60950 - K90000 = K0\ 0950$
- ii. $K60950 - K90000 = K30950$

1. Mr. Mpezeni had K60950. He wanted to buy land which was being sold at K90000. How much more money is needed in order to buy the land?



A handwritten subtraction problem on lined paper. The numbers are written in blue ink. The minuend is 'K 60950' and the subtrahend is '90000'. A horizontal line is drawn under the subtrahend. The result, '30950', is written below the line. To the right of the calculation, there is a large, faint blue arc drawn across the page.

From examples above it was further noted that learners were just subtracting the amount of money without actually considering the values of the subtrahend and the minuend and that frequently learners were also subtracting smaller number from bigger number without considering the position of the digit whether it is a subtrahend or minuend. Furthermore it was also learnt that whenever a smaller number subtracted a bigger

number the solution written by some learners was always zero or no answer as in example from learner's scanned work below:

$$\begin{array}{r} 1560 \\ - 950 \\ \hline 950 \end{array}$$

When covering the topic basic operation of money, addition of money was first to be covered hence learners felt that the first operation in that test should be addition according to the order covered in class. As a result of that, some learners instead of subtracting, they were adding as below;

$$\begin{array}{r} 1560 \\ + 950 \\ \hline 150950 \end{array}$$

Furthermore it was also noted that some learners were continuously regrouping even though there was zero subtracting another zero as evident overleaf:

K	t
90000	00
- 60950	00

20040	00

Furthermore, it was also noted that some learners were subtracting a bigger number from a smaller number but also wrongly as in the following examples from learners scripts; K60950- K90000= K30000; K60950- K90000= K30950; K60950- K90000= K79850.

Item 2: The cost of one chair for the school is K5865. How much will it be paid for six chairs? From data collected, it showed that most of the errors were computational arising from poor multiplication as in examples below which includes scanned work; K5865×6= K65196; K5865×6= K26145; K5865×6= K35170; K5865×6= K31590.

The cost of ~~for~~ one chair for a school is K5865. How much will be paid for six chairs?

Handwritten multiplication of 5865 by 6. The result is 31590, with a correction arrow pointing to the 0 at the end.

Item 3: six pencils were bought by Chisomo at a price of K7866. What was the cost of each pencil?

Miscalculations of division of money; $K7866 \div 6 = K13$; $K7866 \div 6 = K136$; $K7866 \div 6 = K1510$; $K7866 \div 6 = K1621$. The errors and misconceptions are also evident in the script below from one of the learner's scanned work;

Six pencils were bought by Chisomo at a price of K7866. What was the cost of each pencil?



$$\begin{array}{r} 1311 \\ 6 \overline{) 7866} \\ \underline{6} \\ 18 \\ \underline{18} \\ 66 \\ \underline{66} \\ 0 \end{array}$$

Item 4: Mr. Kayuni has goods worth five thousand seven hundred and twenty two kwacha seventy tambala. Mrs. Kayuni also has goods worth thirty thousand one hundred and twelve kwacha fifteen tambala. Find the total sum of money for goods Mr. and Mrs. Kayuni have?

Data from analysis of test scripts indicated that most learners had a wrong idea about addition of money; they thought that if two numbers were written in words and the operation to be applied was addition then those two numbers must be added separately. Learners were splitting each number to several figures and later added as in examples below taken from one of the learners' scripts; some learners were just adding the figures separately without even considering the units.

$$5000+700+22+70= 5792 \text{ and } 3000+100+12+15= 3127$$

4.6 Chapter summary

This chapter has presented the findings of study based on four data collection instruments used. The findings have revealed that teachers and learners used code switching and code mixing for many reasons such as to enable learners' understanding, for translation and to aid explanation. The study also found out that there are a number of common language problems, misconceptions and errors that learners made in mathematics especially those

involving word problems in standard 5 where English is used as a language of instruction. However the findings indicated that teachers devised strategies to deal with the effects of language. The next chapter looks at the discussion of findings presented in this chapter, conclusion of the whole study, recommendations made by the researcher and finally area of further study.

CHAPTER 5

DISCUSSION OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Chapter overview

The study was intended to explore the effects of language on learners' understanding of mathematics in primary school. Four critical questions were set to guide the collection of information for this study. This chapter presents the discussion of findings of the study on the basis of four critical research questions given in section 1.5.2 which were as follows;

- To what extent is English used as a language of learning and teaching during mathematics lessons in standard 5?
- What are the common language problems that learners face in mathematics in standard 5?
- What are the common language misconceptions and errors that learners make in mathematic involving word problems in standard 5?
- What should be done to overcome such language misconceptions and errors?

In order to be focused, the discussion of findings have been organized under themes at each research question explaining the effects of language of instruction in teaching and learning mathematics especially those involving word problems activities in standard 5.

The analyses of data from lesson observations, interviews with mathematics teachers and learners and learners' test indicated that language used for instruction during mathematics lessons in standard 5 has a number of effects. The analyses revealed that the following effects which are represented as themes were analyzed from data:

- Code switching/code mixing
- Difficulties in reading the English language in word problems
- Lack of English statement comprehension
- failure to move from word representations to numerical or symbolic representations
- Learners computational errors
- Incorrect representations of English word problems
- Definition of cue words/phrases by teachers
- Regular practices of word problems by learners
- Early interventions of English word problems
- Translation of English word problems into first language.

The actual findings to support these themes were presented in details in the previous chapter. This chapter presents discussion of findings, conclusion, recommendations made and area for further study.

5.1 Language of learning and teaching mathematics in standard 5

The first objective of this research study was to find out to what extent English was used as a language of learning and teaching during mathematics lessons in standard 5. The analyses of findings on these matters from lesson observations and interviews with both mathematics teachers and learners revealed that English was used to larger extent but

together with Chitumbuka. This meant that there was code switching and code mixing during the process of teaching and learning mathematics. Code switching and code mixing were both used in the same lesson interchangeably.

5.1.1 Code switching/ code mixing

Hoffman (1991) defines code switching as a situation when an individual alternates between two or more languages in the same conversation or use of more than one language in the same conversation while code mixing that refers to insertion of a single word or short phrase within a sentence in another language. The researcher noticed through lesson observations that code switching dominated much by learners while code mixing was commonly used by mathematics teachers. The researcher is of the view that the practice of code switching and code mixing was however against the language of instruction policy in Malawi which stipulates that “All standard 1, 2, 3 and 4 classes in our schools be taught in their own mother tongue as a medium of instruction and English should be used from standard 5 onwards.” (MoEST, 1996). However the policy does not mention code switching and code mixing. The data collected revealed that both teachers and learners were aware of the language of instruction policy in Malawi. The present language of instruction policy allows learners to study English as a subject in standards 1-4, eight to ten lessons per week. The researcher argues that the English language learners are covering in standards 1-4 cannot assist them to understand concepts of word problems activities in mathematics in standard 5. This in part also agreed with findings by Kachaso (1988) that although standard seven learners have had six years of English instruction, English language taught in previous years is not designed to help learners understand

mathematics concepts, terms and ideas. This applies even more to standard 5 learners who have had four years of English learning, the researcher argues that the English language offered in English lessons cannot assist learners understand the word problems concepts in standard 5 hence the need for code switching and code mixing. The data collected from interview with mathematics teachers showed that the practical manifestation of the use of Chitumbuka through code switching and code mixing was mainly used in situations where learners had not understood the newly introduced concept and to provide explanations for instructions to learners in Chitumbuka. However data from four lesson observations and interview with learners revealed that code switching and code mixing were used beyond the situations mentioned by the teachers. The data from interview with mathematics teachers further revealed that both languages English and Chitumbuka were used in one lesson because learners were not familiar with the language of instruction that was used in mathematic lessons. These results support the findings of Setati et al (2008) who pointed out that use of first language in classroom does not have to be in opposition to English. The two languages can be used together in classrooms so that learners can access the mathematics while at the same time have access to English (Setati et al, 2008). The findings from classroom observations also concur with Hoffman (1991) findings that teachers in their study about teaching and learning mathematics were using both learners' first language and English so that they could cooperate in the teaching and learning process. The lesson observations as well as interviews revealed that learners participated better when Chitumbuka and English were used compared to when there was exclusive use of English in a lesson. Mathematics teachers used mostly Chitumbuka with the idea that learners would be able to fully

understand mathematics concepts. Classroom lesson observations showed that learners were active when the teacher used code switching. They were fully interested in learning by participating during group discussions. Mathematics teachers relied also on translation to convey mathematics concepts to learners. Besides, classroom observations showed that sometimes learners were not active when questions were posed in English, but only became interested when the teacher translated the questions from English to Chitumbuka. The results showed that learners were conditioned to translation, which would make them reluctant to learn and answer questions in English. Translations were used to make learners understand clearly and also as a way of providing support which is in line with dialectical social constructivism theory that learners require scaffolding by teachers (Cummins, 1981). However the researcher is of the view that continuous use of translation may lead to a waste of time and promotion of laziness in learners. This may later contribute to learner failure since learners would not answer mathematical word problems if they were taught using English which is the LoLT only. The researcher argues that code switching and code-mixing disadvantaged learners when it comes to assessment tasks which are conducted in English only since there would be no one to assist them in terms of translation of English words to Chitumbuka.

Although the need for code switching is clear, this study found out that sometimes learners were not allowed to use Chitumbuka in the mathematics lessons in standard 5. It was revealed during interview with teachers and learners that Chitumbuka is however only used in the absence of the Primary Education Advisor (PEA) and any other official observing the lessons for fear of being brought to book. Data from lesson observations

indicated that there was also a great deal of code mixing and code borrowing in learner-learner conversations as they discussed word problems in groups or pairs and as the learners engaged in exploratory talk or probing talk which occurred largely in their first language Chitumbuka. However the researcher observed that in learners' code switching and code mixing, Chitumbuka language dominated. The mathematics teachers went on arguing that code switching and code mixing were important in mathematics lessons for they assisted learners to understand the English word problems. This finding is in line with Setati (2003) whose study has argued for the use of the learners' first language in teaching and learning mathematics as necessary support needed while learners continue to develop proficiency in the language of learning and teaching mathematics and at the same time learning mathematics. Findings by Adler (2001) has further shown some ways in which switching between the learner's first language and English by learners and the teacher has enhanced the quality of mathematic interactions in classroom. This again was in line with social constructivism framework and what was also observed in the lessons during group work and pair work where learners interacted freely because they were discussing the word problems in their familiar language, Chitumbuka even though when the researcher went closer to them, the learners stopped talking for fear of the language of instruction policy. This relates to findings from another study conducted in Tanzania by Brock- Utne (2002) which also revealed that learners in a classroom in which English was used as a language of learning and teaching mathematics switched to Kiswahili during group discussions and later on lowered their voices or stopped talking whenever their teacher approached the group. The researcher is of the view that these dilemmas can well be reduced by accepting the concept of code switching or code mixing to be freely

used by both teachers and learners in standard 5 during mathematics lessons. Code switching and code-mixing simply reveal that the language of used in teaching and learning mathematics in standard 5 has an effect on learners understanding of mathematics.

It is observed that the language in which education is conducted is very important as the selected language may enhance or impede the quality of education. Therefore, language of instruction is an important issue especially in a mathematics classroom where we have learners whose language of instruction is different from their first language. The language of instruction can also be a problem, especially when the content or concepts being taught are not in the learners' home language. Findings of this study have shown that learning Mathematics in English in standard 5 created problems for learners whose home language is not English. This simply tells us that learning mathematics using a language of learning and teaching that is not the learners' first language places additional and complex demand on both the teacher and learners which supports findings of Adler (2001). In this study participants have indicated that supplementing English with the learners' first language in teaching and learning mathematics in standard 5 can lead to a better understanding of mathematic especially those involving use of the word problems. This also support the findings of Chitera (2009) who describes that the use of learners' first language has benefits on school progress especially when it is used in the explanation and clarification of word problems concepts in mathematics. This also relates to Chauma (2013) that learners participate actively in the classes where their mother tongue is used. In the study, this was evident when learners were assigned work in groups. From lesson

observations, the researcher noted that learners were actively discussing word problems in their first language Chitumbuka. This is also a clear indication that first language gives learners an opportunity to talk mathematics as argued by social constructivists. Learners can only talk mathematic in groups if they are familiar with the language of instruction used in teaching and learning mathematics. That is why in this study it has been revealed that learners were mostly using Chitumbuka when discussing English word problems in groups whenever their mathematics teacher assigned them work in groups or pairs. Here we can see that the main challenge is stemming from the language of instruction used in teaching and learning mathematics in standard 5. The researcher's views are that when coming up with a new language of instruction policy, it was again necessary to consider the role of language in teaching and learning mathematics. As Ali et al (2014) point out language is a major means of communication within a classroom and therefore and therefore very important in learners construction of understanding. This agrees with Vygotsky's social constructivism theory of learning that concepts cannot be acquired in the conscious form without language and that a child cannot have a conscious understanding of concepts before they are explained in a related context using a language that is familiar to the learners (Sabri et al, 2005). The researcher being a primary school educator subscribes to the views that it is a government policy that English should be used as a language of instruction from standard 5 onwards but the use of code switching and code mixing should be freely used by both teacher and learners in standard 5 during mathematics lessons without fear of supervisors especially the Primary Education Advisors.

5.2 common language problems

The second objective of the study was to find out the common language problems that learners face in mathematics in standard five. The discussions of findings from lesson observations, interviews with both mathematics teachers and learners and from learners' test are presented in four subsections that follow according to the identified main ideas or themes;

5.2.1 Difficulties in reading the English language used in word problems

Information gathered from all the four lesson observations from each study school and interviews with both mathematics teachers and learners revealed that most learners had difficulties in reading the actual English language used in word problems as evident from the information presented in the previous chapter. This is also a clear manifestation that learners are not familiar with the language of instruction used in mathematics in standard 5. As Issa and Yamada (2013) observe that some stakeholders in Mangochi have negative attitudes towards using first language as a language of instruction in lower classes and switching to English in standard 5 because of the communication problems that teachers face in senior classes when using English as a language of learning and teaching. The researcher is too of the views that if learners have difficulties in reading the word problems then certainly those learners cannot work out the word problems correctly. If learners fail to read words and phrases or are reading them incorrectly even after being guided by their mathematics teachers then it cannot be expected of them to understand the sense of the whole word problem. As Kalejaiye (1990) suggests that the first step in working out word problems is to read the actual word problem. In this step learners read

and reread the word problem to understand its meaning, identify what they are given and what they are required to solve. This supports endogenous social constructivist's views which emphasise the individual nature of each learner's knowledge construction process (Cummins, 1981).Kalejaiye (1990) further explains that at this stage the teacher should ask questions which make it clear that learners understand the word problem such as 'what are you given?' 'What are you asked to find?' The researcher is of the view that if learners are failing to read the word problems then they cannot respond to what the teacher is asking from the word problem. It is suggested that it's only through reading that learners are able to interpret the information that is given in a word problem. Even though Kalejaiye (1990) argues that the major difficulty for bilingual learners in solving word problems is their ability to read English. The researcher on the other hand is of the view that the problem is more than reading the individual words there is also the structure of the word problem. As Orton and Frobisher (2005) advise that the length of English words and sentences sometimes affects the difficulty of reading and understanding word problems by learners.

5.2.2 Lack of English statement comprehension

The data collected from lesson observations, interview with mathematics teachers and learners' test have shown that the second common language problem was lack of English statements comprehension. This seems to agree with Kazima (2008) who contends that comprehension of mathematical word problems is another area that highlights the effect of language in learning mathematics. Information collected from analysis of data revealed that most learners lack knowledge and skills to grasp the meaning of some word

problems. As we are aware that the word problems are always expressed in form of statements, the researcher contends that for learners to choose a particular operation in a given word problem they need to get the meaning of the word problem just after completing reading or rereading it. Information collected from analysis of data of learner's test reveals that most learners were often confusing the operation to choose. In most cases addition of money was confused with subtraction of money while multiplication of money was confused with division of money. This indicates that learners lack English statement comprehension because of their incompetence in English language as suggested by their mathematics teachers. This seems to agree with findings by Fasi (1999) that the more competent the learners are in English, the better they are in comprehending word problems in mathematics. These findings support the results of the significant study of children's response to the word problems involving basic mathematics operations such as addition and subtraction undertaken in Israel which suggests that there are particular difficulties for children in recognizing the correct operation where verbal cues 'more or less' are used which later lead learners to select a wrong arithmetic operation (Haylock, 2011). Several areas of research findings from lesson observations as well as from learners' test indicated that learners' lack of English word problems comprehension is one of the contributing factors to their failing to work out word problems perfectly. The data collected from lesson observations further indicated that regardless of teachers giving learners some cue words and phrases in each word problem, learners were still failing to mention those cue words when asked by the teacher. Surprisingly enough, the researcher noticed that learners were mentioning some words that are not even guiding to choosing a particular operation as presented in the

findings of the study in the previous chapter. Another instance was noticed in word problems involving subtraction of money, it was learnt that almost each and every learner was subtracting a bigger number from a small one just because a small number appears first in an English word problem statement. This is also in line with findings of some studies carried outside Malawi as Orton (2006) reports that many learners mechanically add, subtract, multiply or divide whatever numbers they are given in a word problem with little regard to the problem content. This is a clear indication that the language of instruction used in teaching and learning mathematics in standard 5 confuses learners. The researcher noted that lack of English language comprehension was also reported by both mathematics teachers as a threat to learners' failure to work out word problems. Even though the main focus of this study was on English word problems, sometimes the researcher took time to check the performance of learners on non-verbal mathematics operations which were covered prior to word problems. In most cases the researcher found out that learners were doing better but when it came to word problems, learners got confused. The discussion here is in line with what Kazima (2008) describes that research findings have shown that many learners with low competence in English perform better on non-verbal mathematics than on mathematics equivalent word problems. This also relates to findings by Orton (2006) that the English statements in the word problems confuses and misleads many learners even when the mathematics involved is simple.

5.2.3 Failure to move from word representations to numerical and symbolic representation

The next common language problem from analysis of data is failure of learners to move from word representations to numerical and symbolic representations. The researcher is of the view that this is another area that highlights the effect of language of instruction on learners' understanding of mathematics. Information collected from analysis of data from all four sources revealed that most of the learners had slow progress in solving the word problems due to their inability to move from word representations to numerical and symbolic representations. This is very much in line with findings of a study by Bardillion (2004) that translating word problems is the most difficult task for learners especially in the elementary level where English is used as a language of instruction. The researcher's observation is that failure to move from word representations to numerical and symbolic representations in English word problems led to misinterpretation of the word problems that involved subtraction of money to the one that involved addition of money and vice versa and the misinterpretation of the word problems that involved division of money with the one that involved multiplication of money and vice versa. This was highly revealed from the analysis of data from the learners' test where all the four mathematics operations were required in one test. Failure to translate English word problems also led most learners in the test to equate the phrases such as 'how much more' to mean addition and 'total sum' to mean subtraction likewise the phrase 'cost of each' to mean multiplication of money and 'how much will be paid for each' to mean division of money. The researcher also observed that the information given by the mathematics teachers during normal classroom teaching was misleading learners and enhanced

problems in translating English word problem to mathematics symbols. Learners were constantly advised in each and every operation to look for cue words or phrases after reading a word problem instead of trying to understand what the word problem was all about. The researcher argues that this had led learners into wrong translation of word problems into mathematics symbols. As Haylock (2011) contends further that learners sometimes tend just to look for cue words or short phrases and respond to them rather than trying to understand and grasping the logical structure of the word problems. The researcher therefore argues that it is not being surprising that learners use cue words and short phrases to identify a mathematics operation after reading a word problem since they don't understand the English that is used in word problems. The researcher further adds that the fact that mathematics teachers are teaching word problems using cue words strategy is a clear indication that learners do not understand the English word problems in standard five.

5.3 misconceptions and errors in word problems

The third objective of this research study was to find out the actual misconceptions and errors that learners make in mathematics especially those involving word problems in standard 5. In this section misconceptions and errors are discussed concurrently as in most cases they occur at the same time. As Haylock (2011) explains that an error could be the result of carelessness, misinterpretation of symbols or texts, lack of relevant experience or knowledge related to the mathematical concept or as a result of misconceptions. The findings on these matters from learners' test, lesson observations and from interviews with both mathematics teachers are discussed in the subsections that

follow with two major themes. The two themes identified were computational errors and incorrect representations of mathematics word problems. The information from the analysis of data also revealed that the first set of misconceptions and errors were general to mathematics while the second set was specific to language of instruction. However the researcher is of the view that the general misconception and errors erupted as a result of the language of instruction found in English word problems since most of them were not observed in the non-verbal mathematics involving the four basic operations of money.

5.3.1 Computational errors

The researcher observes that some of the misconceptions and errors were as a result of computational errors as evident in the information collected from analysis of data from learners' test, lesson observations and interviews with mathematics teachers as presented in the previous chapter. It is worth noting that the researcher decided to discuss the general misconceptions to mathematics because from snap checks on previous work of learners and from interviews with mathematics teachers, some of these misconceptions and errors were not experienced when learners were working out non-verbal mathematics in basic operation of money. For instance, it was often observed that learners were putting zero whenever a small number was subtracting a big number as in examples reported in the previous chapter. The researcher observed that such errors were not there when learners were covering non-verbal mathematics on 'basic operation of money.' The researcher is therefore of the views that these misconceptions and errors might have occurred as a result of confusions met by learners in mathematics involving use of English word problems. In other circumstances analysis of data revealed that learners

used a correct operation and procedure but arrived at an incorrect final answer or sometimes learners were using a correct arithmetic operation but accompanied with a very wrong procedure or method. These misconceptions and errors are what Radatz (2009) categories as emanating due to processing iconic representations or due to deficiencies of mastery pre requisite skills, facts, and concepts. In line with Fajemidagba (1986), these errors are identified as static syntactic usually committed in mathematics word problem solving together with semantic errors which are discussed in the next coming theme. The researcher's view is that these misconceptions and errors were also as a result of language used in communicating the word problems concepts to learners in standard 5.

5.3.2 Incorrect representations of mathematical statements derived from word problems

According to information collected from lesson observations, interviews with mathematics teachers as well as learners' test, learners' misconceptions and errors were as a result of incorrect representations of mathematical statements derived from word problems. These form a group of errors purely occurring as a result of language of instruction. In standard 5 the misconceptions and errors were inevitable because learners are using a new language of instruction. This agrees with findings of a similar study conducted by Sabri et al (2005) in Turkey in a science lesson on topic "energy" which indicated that learners produced a number of misconceptions and errors as they started using English as a language of learning and teaching from Turkish in grade nine. The researcher is again of the view that although the findings of the study were based on

science and not mathematics, it still has relevance for mathematics instructions since these two subjects are related. These group of errors are what Fajemidagba (1986) referred to as semantic errors which are committed as a result of inadequate understanding of the language of the word problem. Data collected from analysis of learners' test showed that subtraction of money is the fundamental basic operation of money most standard 5 learners had difficulties with seconded by division of money. This is so because interchanging of values was mostly observed in the items involving subtraction of money as presented in the findings of the study in previous chapter. That was the interchanging value for minuend in subtrahend and vice versa. This is however different from the findings of the study by Bardillion (2004) that division of money was the operation that learners had most difficulties with seconded by subtraction of money. Least difficulties were mostly observed in identifying multiplication of money. However in multiplication of money two areas deserves discussion. The first one was where some learners were multiplying with zero whenever the multiplier was written in words while the multiplicand was expressed in figures. The second one was where some learners were multiplying with whatever number found in a word problem apart from the multiplier and the multiplicand given in that particular word problem as in example given in the previous chapter in the information of data analysed from lesson observations. The researcher is therefore of the view that this is evident that learners did not understand the language of instruction used in mathematics. The researcher's expectations again were that least difficulties would have been experienced in addition of money as it was the first operation to be covered in classroom but this was not so because the word problems involving addition of money had all numbers in words. Hence learners had problems in

translating the given numbers from words to figures as discussed earlier on when we were discussing the language problems faced by learners. Analysis of data from learners' test revealed that subtraction of money was mostly confused with addition of money and vice versa while multiplication of money was confused with division of money and vice versa. Information based on learners' test and interview with teachers also indicated that some learners were choosing a mathematics operation after reading the word problem based on the context of the order those operations were covered in class but not necessary on understanding the actual word problem. The researcher observed that when covering the topic 'basic operation of money', addition of money was first to be covered hence learners felt that the operation to use in the first item of the test was addition and so on according to the order covered in class. This also emphasizes the observation that learners do not understand the language used for communicating the word problems in standard 5.

5.4 Overcoming language problems, misconceptions and errors

The last but not least objective of this study was to find out strategies that teachers and learners mostly use or could use in order to overcome or minimize such language related problems, misconceptions and errors that learners face in mathematics especially those involving English word problems in standard 5. The analysis of findings from lesson observations and interviews with both mathematics teachers and learners on these matters revealed four themes as presented as subsections below:

5.4.1 Definitions of cue-words/short phrases or use of vocabulary sheets

Data collected from lesson observations and interviews with mathematics teachers revealed that teachers constantly gave learners some cue words and short phrases that once found in a particular word problem they represented an operation to be applied. This also supports the views of exogenous social constructivism which denotes that learning of mathematics must be induced from the outside usually by the teacher (Cummins, 1981). The cue words and short phrases were emphasized before the mathematics teachers started working out an example with learners in every mathematics operation covered on the topic 'basic operation of money.' Teachers went to an extent of writing all the cue words and short phrases under each mathematics operation and displayed them on the chalkboard using a vocabulary sheet. This partly agrees with Kachaso (1988) who recommended that learners should be taught mathematics vocabulary and that the authors of Malawi primary mathematics books should be required to devise a glossary of the technical terms or concepts to be learnt in each unit. From lesson observations, the researcher is of the view that this practice of using cue words basically was designed to assist learners who could not read and understand the English word problems so that they could only identify the cue-words to know what to do. According to the mathematics teachers, the practice of defining cue word and short phrases was useful because it guided most learners to easily identify an operation to use just soon after reading the word problem. The researcher further observed that this worked very well when teachers were covering each operation at a time in classroom teaching and learning process but during the learners' test where the idea of identifying cue words and short phrases was not successful. This is also in line with Adetula (1990) that when learners do not understand

the word problems they often resort to cue-strategy that is searching for word which will give them hint of which arithmetic operation to carry. However the researcher on the other hand is of the contrary view of this strategy because of what was observed during the learners' test at the end of topic 'basic operation of money' where all the four operations were asked in a single test. It was learnt that most learners were unable to identify the cue-words that they easily identified during normal classroom teaching and learning where each mathematics operation involving money was covered separately. The researcher further contends that this is another area which indicates that learners have a problem in reading the English language used in word problems. This is so because the cue words that the mathematics teachers asked in the test were the same one that learners used in class when each mathematics operation was covered separately. The researcher therefore argues that this is another area that expresses a great issue of concern with the language of instruction used in mathematics in standard 5.

5.4.2 Regular practices of mathematics involving word problems

As the saying goes 'practice makes perfect.' Data collected from analysis of interviews with mathematics teachers as well as learners indicated that regular reading and writing practices of English word problems is also a preference to overcome common language problems, misconceptions and errors faced by learners in mathematics that involve word problems in standard 5. As one way of enhancing reading ability, findings from lesson observations revealed that mathematics teachers were asking learners to read the word problems several times as an initial stage to solving word problems. The mathematics teachers argued that acting as well as use of shopping scenes enhanced learners

understanding of the message depicted in word problems. However the researcher observed that learners were not given enough time to practice the word problems as individuals. If time was really an issue, there was need for learners to be given take home exercises as a way of encouraging regular practices. However for learners to practise word problems regularly, it also all depends on learners mastery of the language of instruction used. This agrees with Orton (2006) that learners need only to master a particular basic operation through regular practices at each stage of solving word problems when they have a full knowledge of language used otherwise a lot of misconception and errors may arise. This further relates to the findings by Fisher (2005) that thinking involves the use of words and concepts. One way of assisting learners to develop their thinking is to help them understand the language used to communicate concepts and words by regular practices otherwise a lot of language related problems, misconceptions and errors might arise (Fisher, 2005). Data collected from analysis of learners' interview revealed that most learners opted for extra lessons outside the school hours as a solution to assist them in practising word problems regularly since their teachers were not giving them enough time for practice. However the researcher is of the contrary view about extra lessons outside the school hours or tuitions as suggested by learners. From the researcher's own observation as a former primary school teacher, extra lessons after school hours affect learners' learning of mathematics in a classroom situation because sometimes learners deliberately choose to not pay attention to teachers because they are confident that the materials the teacher is covering in classroom, they are going to cover again or have already been covered by their part time teachers. The

researcher has also observed from experience that in some cases, the same mathematics teacher is also the extra tuition teacher for some learners in his/her class.

5.4.3 Early intervention of English word problems

Information from analysis of data from teachers' interviews indicated that English is introduced late as a language of instruction for mathematics in standard 5. This is clear indication that teachers were concerned with the late introduction of English as a language of instruction for mathematics in standard 5. Mathematic teachers indicated that English should start be used as a language of learning and teaching in mathematics as early as in standard 3 to prepare the learners for Malawi National Examination Board (MANEB) examinations. The researcher is of the view that the main reasons given by mathematics teachers were not for immediate understanding of mathematics, but rather because learners would be required to learn mathematics in English in the upper classes. However this identifies a contradiction between the immediate needs of learners to use English as a language of learning and teaching mathematics in standard 5 and to what the mathematics teachers were suggesting. The mathematics teachers' opinion is that learners at primary school are being prepared for secondary school education hence the introduction of English mathematics word problems should not always be delayed too long. The teachers' observation is in line with Kachaso (1988) who observes that introducing English word problems very late might affect standard or results at secondary school and that an alteration to a late start of English instruction in teaching and learning mathematics word problems would be the promotion of bilingualism during teaching. The information from interview with mathematics teachers also indicated that teachers

were concerned with the present language of instruction policy which states that English should be used as a language of instruction from standard 5 onwards. However the researcher observes earlier on that teachers support the idea of using English as a language of instruction in standard 5 rather than teaching mathematics in Chitumbuka in totality but with code switching and code mixing. The researcher also observes that the information given by the mathematics teachers presents a contradiction that they are using code switching and code mixing in standard 5 because learners cannot understand English and yet the same mathematics teachers suggested earlier on that the English mathematics word problems would have been introduced lower than standard 5. The researcher is of the view that how one could expect learners to understand the English word problems in standard 3 if learners in standard 5 fail to understand them. Hence one would expect to introduce the English word problem higher than standard 5 according to the information given by mathematic teachers

5.4.4 Translation of English word problems into Chitumbuka

Information derived from analysis of data from lesson observations, interviews with teachers and learners indicated that one way of assisting learners to overcome common language problems, misconceptions and errors was to translate the whole word problem into Chitumbuka or just to translate some cue words or short phrases into Chitumbuka. This was mentioned by most learners interviewed with a reason that it would enhance their understanding of the word problem. The teachers used translation in circumstances where all learners had failed to work out a particular word problem correctly or if all learners had failed to explain the meaning of a particular word problem after being asked

by the teacher. The teachers revealed that they were doing all that in order to promote thinking in learners. This seems to support the claim by Orton (1987) that the language used for thinking is always likely to be the first language ,thus mathematics communicated in learners' second language might need to be translated into another to allow thinking and then would need to be translated back in order to converse with the teacher . This also agree with findings of the study by Setati et al (2008) which indicates that the strategy of translation of English word problems to learners' first language improves learners comprehension of the word problems.

5.5 Conclusions of the study

The study investigated the effect of language on learners understanding of mathematics especially those involving use of word problems in standard 5. The thesis has discussed previous literature related to the topic of this study and developed a theoretical framework which guided the study. The literature review consisted of an introduction on the sources of literature relevant to the study. Literature was reviewed on the trend to the present language of instruction policy in Malawi since the colonial period, effects of teaching mathematics in learners' first language and learners' second language, word problems in mathematics and misconceptions and errors that learners make in mathematics involving word problems taught in learners' second language.

The study adopted the qualitative paradigm with a triangulated design in order to collect data and results that could adequately address the objectives of the whole study (Patton, 1990). The sample population was made up of two government primary schools, two

standard 5 mathematics teachers and 113 standard 5 learners from the two schools. The researcher used convenience, random, purposeful and stratified sampling procedures to select schools and participants in this study. The instruments of research used were lesson observation checklist for teachers, interview guide for mathematics teachers, interview guide for learners and learners' test. All instruments were administered by the researcher personally and data were collected in a period of four weeks. The data collected was analysed using the most common approach to qualitative research known as thematic analysis or inductive analysis. The presentations of the findings were based on the four critical research questions described below.

The main or general research question was: What are the effects of language on learners' understanding of mathematics in primary school? Four critical questions were explored; the first question was: To what extent is English used as a language of learning and teaching during mathematics lessons in standard 5? The second question was: What are the common language problems that learners face in mathematics in standard 5? The third question was: What are the common language misconceptions and errors that learners make in mathematics involving word problems in standard 5? The fourth and last question was: What should be done to overcome such language misconceptions and errors?

The study has found out that the language of learning and teaching (LOLT) that is used to a larger extent when teaching and learning mathematics in standard 5 is English. However it was revealed during analysis of data from lesson observation and interviews

with both mathematics teachers and learners that English which is a language of instruction in standard 5 according to language of instruction policy in Malawi is supplemented with learners' first language, Chitumbuka. This means that two languages of instruction are used in teaching and learning mathematics in standard 5 which is contrary to the language of instruction policy in Malawi. Mathematics teachers are using code switching between English and Chitumbuka which is a communication strategy or situation where two languages are used in the same utterance (Adler, 2001). In other situations, it was also revealed that both mathematics teachers and learners were inserting a single Chitumbuka word or short phrase within the English language and vice versa in the process of teaching and learning mathematics. This situation is referred to as code mixing or code borrowing (Adler, 2001). These findings support the findings of Setati et al (2008) that first language of learners (in this case Chitumbuka) can sometimes be used as a resource to aid learners understanding of mathematics where the unfamiliar language is used as a language of instruction. Information collected from analysis of interview data with both mathematics teachers and learners showed that they were happy with the strategy of code switching and code mixing. On the other hand both teachers and learners still maintained that English should be used as a language of instruction in mathematics in standard 5 for various reasons as presented in chapter 4. This implies new debate as to whether to continue insisting on using English as a language of learning and teaching mathematics in standard 5 or to formally allow the practice of code switching and code mixing as the situation now stands on ground. The implication of these findings is that if code switching and mixing are maintained then English as a language of instruction in mathematics in senior primary schools will be introduced very late consequently learners

in Malawi might not develop much fluency in English hence might be at a disadvantage at global stage. As argued by Chitera (2009) that colonial languages such as English and French have more benefits for learners when they are used as languages of learning and teaching in primary schools because they are often spoken widely elsewhere in the world. This is also in line with Chauma (2013) who argues that English language is seen as a symbol of power, status and prestige and often used to gain access to tertiary education, jobs and businesses among other things valued in life.

The study has also found out that the main language problem that most learners face in mathematics involving word problems in standard five is difficulties in reading the actual English language used in word problems. This is regarded as the main problem following the findings by Kalejaiye (1990) that the first step in solving the word problems is the ability to read. Hence the researcher contends that if a learner fails to read the word problem then this implies that one cannot continue well with other remaining stages of working out a word problem. The implication behind this matter that the English word problems in standard 5 lack validity for many learners because they are more of a test in reading English than mathematical understanding. Therefore learners need to be assisted if they cannot read the English word problems. Another common language problem faced by learners is lack of English statement comprehension. This implies that learners are mostly challenged by mathematical word problems not because of their mathematical skills but because of text comprehension. The researcher argues this problem which is to the large extent related to reading English statements shows that learners cannot understand something that they have difficulties in reading. Another language problem is

failure of learners to move from words representations to numerical and symbolic representations. This problem is also related to comprehension of English statements. The researcher contends that learners can only move from words representations to numerical and symbolic representations if they are familiar with the language of instruction used.

The study also analysed the misconceptions and errors that learners faced in mathematic involving word problems where English is used as a language of instruction. Results obtained from lesson observations, interviews with mathematics teachers and learners' test revealed that there are two categories of misconceptions and errors that learners make in mathematics involving word problems in standard 5: those that are general to mathematics operations and the ones that are specific to language of instruction as evident in the information from the analysis of data presented in the previous chapter.

The general misconceptions and errors that arise from computational processes have also been included in the discussion of findings because during non-verbal mathematics these were not there. On the other hand, the misconceptions and errors that are specific to language of instruction arise from incorrect representations of English mathematics statements. The findings of this study revealed that some of the misconceptions and errors on word problems are familiar to the ones discussed in chapter 2 of literature review while others have not been described in the literature and hence unique to this study. A good example is where some learners are multiplying with zero in a situation where the multiplier is written in words while the multiplicand is written in figures as presented in the findings of this study. This implies that if the word problems involving multiplication of money contain the multipliers that are expressed in words some learners

have problems in working them out as opposed to when both multipliers and multiplicands are expressed numerically.

The study finally analysed the strategies that are used or could be used collectively to overcome common language problems, misconceptions and errors. According to the findings of the study from lesson observations, interviews with mathematics teachers and learners, the following strategies are used: definitions of cue-words/short phrases or use of vocabulary sheets, regular practices of mathematics involving word problems, early intervention of English word problems and translation of English word problems into Chitumbuka as outlined in the discussion of findings.

The researcher is again of the view that if the use of code switching and code-mixing is accepted then mathematics teachers as well as learners are going to use the two languages English and Chitumbuka or any other familiar language freely particularly in standard 5 where learners experience a new language of instruction in mathematics. After all various studies have indicated ways in which switching between the learner's first language and English by learners and the teacher has enhanced the quality of mathematic interactions in classroom(Adler,2001). The code switching and code mixing mentioned in this study have implications on teaching and learning of mathematics in standard 5 as observed earlier on where learners have difficulties with language of instruction used. For instance code switching and code mixing are so useful that they help learners to understand easily the concepts of the English word problems being taught. Code

switching helps teachers to clarify cue word and short phrases so that they become meaningful to the learners.

Secondly, there is need to promote an ‘Integrated Approach’ to teaching and learning of mathematics in primary school. In this approach, mathematics teachers need to contact language teachers to discuss their common language problems or a discussion between different teachers on the vocabulary that they are using. This may help to prevent different names being used for the same concept or the misuse of mathematical terminology by other teachers.

Thirdly, the researcher suggests that there is need to allow learners to discuss the English word problems in their familiar language as they interact in their groups. This supports the social constructivist’s views that learning mathematics requires construction and not merely passive reception and that mathematics learning should be viewed as a process of active individual construction (Huitenct and Munshin, 2004:153).

5.6 Recommendations

This section makes some recommendations based on the findings and conclusions of the study on effects of language on teaching and learning mathematics in primary schools. In view of that, the following recommendations are made:

- The teachers’ and learners’ first language (such as Chitumbuka) should be used as a supplement to English in teaching mathematics in standard 5 to enhance the learner’s understanding of the concepts of word problems. In view of this,

mathematics teachers should explain the word problems in the learners' language, particularly when the teacher notices that the learners in standard 5 are having difficulty in understanding the concepts of word problems in English.

- There should be an ongoing professional development for mathematics teachers in the area of word problems. Mathematics teachers should be more aware of the effectiveness that teaching and learning strategies can offer to overall learners' achievements on word problems.
- The curriculum developers should come up with clear guidelines on language of instruction policy which would cater for the use of code switching and code mixing by both mathematics teachers and learners when teaching and learning mathematics right away from standard 3 where word problems are introduced in Chichewa up to standard 5 where learners start using English as a language of instruction.

5.7 Areas for further study

From what has been revealed from this study, there is need for further research over the whole area of interrelationship between primary mathematics education and language of learning and teaching. The researcher is of the view that particular attention is drawn to the following areas where research is necessary:

- Exploring ways for teaching the concept of word problems in primary schools using both English and Chitumbuka.
- How do primary schools Teacher Training Colleges (TTC) in Malawi prepare student teachers to handle the concepts of word problems in classroom?

- Examining the stages at which second language, English can most conveniently replace the mother tongue as a language of learning and teaching mathematics in primary school.

5.8 Chapter summary

This chapter has discussed the findings of the study and further looked at the conclusion of the whole study including a summary of the literature review and a summary of research method employed in this study. The discussion of findings of the study has indicated that English which is used as language of instruction in standard 5 has several effects on learners' understanding of mathematics involving word problems. However the discussion of the study has revealed that teachers use several strategies to overcome the challenges encountered. The chapter then presents a summary of the study by drawing conclusion and implications of the findings. This chapter closes with some recommendations made by the researcher in addition to areas of further study based on the findings of this study.

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APPENDICES

APPENDIX 1A: LESSON OBSERVATION CHECKLIST FOR PILOT STUDY

DATE: ----- TIME: ----- CLASS: -----

-

NAME OF SCHOOL: -----

-

NUMBER OF LEARNERS: ----- BOYS ----- GIRLS -----

-

NAME OF TEACHER: -----

-

EDUCATION QUALIFICATION: -----

-

TEACHING EXPERIENCE: -----

-

TOPIC: -----

-

LESSON OBJECTIVES: -----

TEACHING AND LEARNING RESOURCES AVAILABLE: -----

TEACHING AND LEARNING METHODS USED: -----

ACTIVITY	OBSERVATION
1. Language of instruction used. (need to quantify the times language are used by tallying; need also to record length of each episodes in a particular language; record code switching and their episodes)	
2. Lesson introduction (focus on language used by both teacher and learners)	

3. Worked examples by teacher (focus on language)	
4. Teachers explanations (focus on language used)	
5. Exercises for learners (focus on language on language used)	
6. Learners responses and discussions in groups • Responding to questions from teacher • Asking questions. (focus on language Used)	

7. Common language problems faced by learners in the lesson (need to record everything observed)	
8. How the teacher and learners are overcoming such language problems	

9. misconceptions made by learners throughout the lesson	
10. How the teacher is overcoming misconceptions made by learners.	
11. Common errors made by learners in throughout the lesson. (mainly in the example and exercise writing)	
12. methods used to overcome such errors	
13. general comments if any	

**APPENDIX 2A: SAMPLE INTERVIEW GUIDE FOR CLASS TEACHERS;
PILOT STUDY**

INTERVIEW NUMBER: -----

-

NAME OF SCHOOL: -----

-

ZONE: -----

-

INTERVIEWER: -----

-

INTERVIEWEE: -----

-

SEX: -----

-

AGE: -----

-

TEACHING EXPERIENCE: -----

-

DATE: -----

-

TIME: -----

-

(Question 1)

What language of learning and teaching do you usually use during mathematics lessons in standard five?

(Question 2)

Why do you teach in the language mentioned above?

(Question 3)

Do you allow your learners to use their native language, Chitumbuka during mathematics lessons? If yes, in what occasion? How often? Why?

(Question 4)

What do you think about the language of instruction policy in Malawi?

(Question 5)

What language of learning and teaching would you prefer to be used in standard 5 during mathematics lessons? (Give reasons for your choice)

(Question 6)

Tell me any situation in which you think instruction in Chitumbuka is necessary

(Question 7)

What language related problems do you face when teaching word problems in English?
Give examples

(Question 8)

How do the problems mentioned in (7) above affect teaching and learning of mathematics word problems?

(Question 9)

What do you think should be done in order to overcome such language related problems?

(Question 10)

From your own observation as a class teacher, what are the common misconceptions that learners make with word problems in reference to topic ‘basic operations of money’ in standard 5?

(Question 11)

What do you think is the source of each misconception mentioned in (11) above

(Question 12)

What do you think should be done in order to overcome such misconceptions?

(Question 13)

What type of errors involving language do learners commit in mathematics word problems in standard 5? (You may even recite some examples with reference to basic operations of money)

(Question 14)

What do you think should be done to overcome such errors?

APPENDIX 3A: INTERVIEW GUIDE FOR LEARNERS; PILOT STUDY

INTERVIEW NUMBER: -----

-

CLASS: -----

-

NAME OF SCHOOL: -----

-

ZONE: -----

-

NUMBER OF PARTICIPANTS: ----- BOYS----- GIRLS-----

-

START: -----

-

END: -----

-

MODERATOR: -----

-

NOTE TAKER: -----

-

(Question 1)

What language of learning and teaching is used during mathematics lesson by?

- teachers
- learners

(Question 2)

What language would you prefer to be used as a language of learning and teaching in mathematics? (Give a reason for you answer).

(Question 3)

Have you ever worked out mathematics involving word problems ever since you entered standard 5? (If yes how often). What about before you enter standard five?

(Question 4)

What problems do you face with English word problems in mathematics?

(Question 5)

What do you think should be done in order to overcome such language related problems?

APPENDIX 4A: LEARNERS' TEST FOR PILOT STUDY

END OF TOPIC “BASIC OPERATIONS OF MONEY” TEST MATHEMATICS (STANDARD 5)

1. Mr. Mpezeni had K60950. He wanted to buy land which was being sold at K90000. How much more money is needed in order to buy the land?
2. The cost of one chair for a school is K5865. How much will be paid for six chairs?
3. Six pencils were bought by Chisomo at a price of K7866. What was the cost of each pencil?
4. Mr. Kayuni had goods worth five thousand seven hundred and twenty two kwacha seventy tambala. Mrs. Kayuni also had goods worth thirty thousand one hundred fifteen tambala. Find the total sum of money for the goods Mr. and Mrs. Kayuni had.

APPENDIX 1B: LESSON OBSERVATION CHECKLIST FOR MAIN STUDY

DATE: ----- TIME: ----- CLASS: -----

-

NAME OF SCHOOL: -----

-

NUMBER OF LEARNERS: -----BOYS----- GIRLS-----

-

NAME OF TEACHER: -----

-

EDUCATION QUALIFICATION: -----

-

TEACHING EXPERIENCE: -----

-

TOPIC: -----

-

LESSON OBJECTIVES: -----

TEACHING AND LEARNING RESOURCES AVAILABLE: -----

TEACHING AND LEARNING METHODS USED: -----

ACTIVITY	OBSERVATION
1. Language of instruction used. (need to quantify the times language are used by tallying; need also to record length of each episodes in a particular language; record code switching and their episodes)	
2. Lesson introduction (focus on language used by both teacher and learners)	

3. Worked examples by teacher (focus on language)	
4. Teachers explanations (focus on language used)	
5. Exercises for learners (focus on language on language used)	
6. Learners responses and discussions in groups • Responding to questions from teacher • Asking questions. (focus on language Used)	
7. Common language problems faced by learners in the lesson (need to record everything observed)	
8. language misconception and errors made by learners throughout the lesson	
9. how the teacher is overcoming such language problems, misconceptions and error made by learners in the lesson	

**APPENDIX 2B: SAMPLE INTERVIEW GUIDE FOR CLASS TEACHERS;
MAIN STUDY**

INTERVIEW NUMBER: -----

-

NAME OF SCHOOL: -----

-

ZONE: -----

-

INTERVIEWER: -----

-

INTERVIEWEE: -----

-

SEX: -----

-

AGE: -----

-

TEACHING EXPERIENCE: -----

-

DATE: -----

-

TIME: -----

-

(Question 1)

What language of learning and teaching do you usually use during mathematics lessons in standard five?

(Question 2)

Why do you teach in the language mentioned above?

(Question 3)

Do you allow your learners to use their native language, Chitumbuka during mathematics lessons? If yes, in what occasion? How often? Why?

(Question 4)

What do you think about the language of instruction policy in Malawi?

(Question 5)

What language of learning and teaching would you prefer to be used in standard 5 during mathematics lessons? (Give reasons for your choice)

(Question 6)

Tell me any situation in which you think instruction in Chitumbuka is necessary.

(Question 7)

What language related problems do you face when teaching word problems in English? Give examples.

(Question 8)

How do the problems mentioned in (7) above affect teaching and learning of mathematics word problems?

(Question 9)

From your own observation as a class teacher, what are the common misconceptions and errors that learners make with word problems in reference to topic ‘basic operations of money’ in standard 5?

(Question 10)

What do you think is the source of each misconception and errors mentioned in (10) above?

(Question 11)

What do you think should be done in order to overcome such language, misconceptions and errors mentioned above?

APPENDIX 3B: INTERVIEW GUIDE FOR LEARNERS; MAINSTUDY

INTERVIEW NUMBER: -----

-

CLASS: -----

-

NAME OF SCHOOL: -----

-

ZONE: -----

-

NUMBER OF PARTICIPANTS: ----- **BOYS**----- **GIRLS**-----

-

START: -----

-

END: -----

-

MODERATOR: -----

-

NOTE TAKER: -----

-

(Question 1)

What language of learning and teaching is used during mathematics lesson by?

▪ Teachers _____

—

▪ Learners _____

(Question 2)

What language would you prefer to be used as a language of learning and teaching in mathematics? (Give a reason for your answer).

(Question 3)

Have you ever worked out mathematics involving word problems ever since you entered standard 5? (If yes how often). What about before you entered standard five?

(Question 4)

What problems do you face with English word problems in mathematics?

(Question 5)

What do you think should be done in order to overcome such language related problems?

APPENDIXE 4B: LEARNERS' TEST; MAIN STUDY

END OF TOPIC "BASIC OPERATIONS OF MONEY" TEST

MATHEMATICS (STANDARD 5)

1. Mr. Mpezeni had K60950. He wanted to buy land which was being sold at K90000. How much more money is needed in order to buy the land?

2. The cost of one chair for a school is K5865. How much will be paid for six chairs?

3. Six pencils were bought by Chisomo at a price of K7866. What was the cost of each pencil?

4. Mr. Kayuni had goods worth five thousand seven hundred and twenty two kwacha seventy tambala. Mrs. Kayuni also had goods worth thirty thousand one hundred fifteen tambala. Find the total sum of money for the goods Mr. and Mrs. Kayuni had.

APPENDIX 5: LETTER OF APPROVAL FROM CHANCO



CHANCELLOR COLLEGE

Principal: Richard Tambulasi
B.A (Pub Admin), BPA(Hons) MPA, PhD

P. O. Box 280, Zomba, MALAWI
Tel: (265) 01 524 222
Telex: 44742 CHANCOL MI
Fax: (265) 01 524 046
Email: deaned@cc.ac.mw
bchulu@cc.ac.mw

OFFICE OF THE DEAN OF EDUCATION

16th December, 2015

TO WHOM IT MAY CONCERN

Dear Sir/Madam

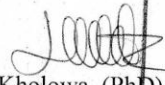
LETTER OF INTRODUCTION (MASTER OF EDUCATION)

The Faculty of Education would like to introduce to you Mr Montmoris N.M.C. Chimaliro, Registration no. MED/PR/SC/09/14, Chancellor College M.Ed Student who is supposed to do research in area of his interest.

This letter serves to request you to assist him with data collection in your institution.

The Faculty of Education will appreciate your support in this very important aspect of our students' training.

Yours faithfully,


F. Kholowa, (PhD)
DEAN OF EDUCATION
FACULTY OF EDUCATION

UNIVERSITY OF MALAWI
CHANCELLOR COLLEGE

2015 -12- 16

cc: Supervisor

APPENDIX 6: LETTER TO THE HEADTEACHERS



CHANCELLOR COLLEGE

FACULTY OF EDUCATION

LETTER TO THE HEADTEACHER

DATE: 4th January, 2016

FROM: Montmoris N.C.M. Chimaliro, Chancellor College, Box 280, Zomba.

TO: The head teacher, ----- Full primary School, **Karonga**

CC: To the Primary Education Advisor (PEA), P.O. Box 37, **Karonga**

The District Education Manager (DEM), P.O. Box 37, **Karonga**.

Dear sir/ madam,

RESEARCH STUDY

I am a Masters student under Faculty of Education at the University of Malawi, Chancellor College. My thesis supervisors are Associate Professor Mercy Kazima-Kishindo and Associate Professor Dorothy Nampota. I am also a lecturer of Mathematics, Science and Technology at Karonga Teachers' Training College. For the final year in my Masters program, I am hoping to conduct a research study which examines standard five learners' language difficulties in mathematic involving word problems. I have selected your school as one of the schools to collect data for this study.

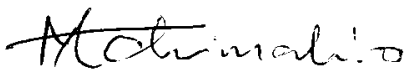
The purpose of the study is to investigate the effect of language of instruction on learners' understanding of Mathematics involving word problems activities in standard 5 and to suggest some remedial measures to overcome these difficulties. In order to examine learners' language of instruction problems, errors and misconceptions, I wish to administer a test instrument to learners in standard 5 after being taught preferable the topic basic operations of money involving word problems in English by their class teachers. Some learners will be selected for reflective interviews based on their answers to exercises given by their teachers during the course of teaching and learning the topic basic operations of money or any other topic that will be purposefully selected. I also hope to interview the mathematics teacher of those learners to get his/her views on learners' common language problems, errors and misconceptions that learners make in mathematics involving word problems and how they are overcoming such common language problems, misconceptions and errors.

I would therefore like to request the participation of your school in this study by allowing me to conduct lesson observations, interviews and a short test on the topic observed. The teachers will be given a summary of their interviews later. You will also be given an opportunity to receive a summary of the findings at the end of the research study. I will not use teachers' or learners' names or anything else that might identify them in the written work, oral presentations, or publications of my thesis. The information will remain confidential.

If you would like more information, please contact me by phone at 0999609806; 0882476642 or by e-mail at mchimaliro@yahoo.com. Please contact me at your earliest convenience to discuss the work or to provide your consent to participate.

Thank you for your consideration.

Yours sincerely,


Montmoris N.C.M Chimaliro.