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# Challenges of Grade 6 Learners' Experience when Solving Mathematical Word Problems

BY

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## ABSTRACT

Poor performance in solving mathematical word problems is a long standing challenge for all learners. The mastery or understanding of word problems is seen as a crucial test of mathematical ability. When solving such problems, learners supposedly go beyond rote learning and memorization of facts and rules without understanding in order to get the correct answer. Research shows that performance on word problems is increasingly becoming poorer and poorer every year. This study is aimed at investigating the challenges that learners face and the difficulties they encounter when solving mathematical word problems. In particular, the influence of English language proficiency and problem-solving skills learners possess were investigated as well as any other factors which could have been contributing to the challenges the learners came across.

Grade 6 learners formed the subjects for the study. The researcher believes that Grade 6 is a very important class due to the fact that it serves as both the end of Intermediate phase and the starting point of the Senior Phase. In this regard, learners in Grade 6 level should be given more attention than other classes because they are on a transition stage. The sample was from 10 schools selected randomly from a population of 18 schools in the Tshinane Circuit of the Vhembe District in the Limpopo Province. Questionnaires in the form of written tests were used and analysed quantitatively to identify the challenges and the difficulties the learners experienced. The questionnaires were analysed qualitatively to investigate these challenges in order to enable to understand and give a description. The study revealed that lack of teaching word problems in the learning and teaching situation was a strong predictor of learners' success in solving word problems. Findings in this study also suggest that language proficiency in general is a barrier to a good performance among learners.

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To all people acknowledged above, I dedicate this study. I salute you all for the good work you did. May the good LORD richly bless you until the end of your journey.

## Declaration BACKGROUND OF THE STUDY

I, the undersigned, hereby declare that the work contained in this study is my own work and that I have not previously submitted it to any university for a degree.

Signature..... F.A. Dube..... Date: 20/03/2012

Adler (1981) argued against this view. He argued that only manipulating symbols and operations can be meaningless because the meaning in Mathematics comes from understanding the meaning of rules, facts, procedures, symbols and operations. This may raise the question: if mathematics is not a collection of rules, facts, formulas and for manipulating symbols and operations on numbers, what is it?

My experience as both a learner and a Mathematics teacher revealed that Mathematics is viewed by many people as manipulation of symbols and operations only, as other researchers such as Brodie (2002: 75); Adler, (2002: 122) have already indicated. Since Mathematics is my teaching subject, during my studies in the field of Mathematics education changed this view for me dramatically. I therefore argue that Mathematics is not manipulation of symbols and operations only in order to get the solution or an answer to the problem. Rather, Mathematics is more than working with numbers, symbols and operations. This means that mathematics is also about finding questions or problems which can then be answered by applying Mathematical knowledge, skills and different strategies.

## CHAPTER 1: BACKGROUND OF THE STUDY

### 1.1 INTRODUCTION

Research in Mathematics education has shown that many people think that Mathematics is a collection of rules, facts, procedures and manipulation of symbols and operation on numbers to get the right answers or solutions only (Brodie, 2002). Mathematics is also one way of making sense of things. It enables us to see patterns, to comprehend data and to reason carefully.

Davis (1981) argued against this view. He argued that only manipulating symbols and operations can be meaningless because the meaning in Mathematics comes from understanding the meaning of rules, facts, procedures, symbols and operations. This may raise the question: If mathematics is not a collection of rules, facts, formulas and for manipulating symbols and operations on numbers, what is it?

My experience as both a learner and a Mathematics educator revealed that Mathematics is viewed by many people as manipulation of symbols and operations only, as other researchers such as Brodie, (2002 :75); Adler, (2001:102) have already indicated. Since Mathematics is my teaching subject, furthering my studies in the field of Mathematics education changed this view for me dramatically. I therefore argue that Mathematics is not manipulations of symbols and operations only in order to get the solution or an answer to the problem. Rather, Mathematics is more than working with numbers, symbols and operation. This means that mathematics is also about finding questions or problems which can then be answered by applying Mathematical knowledge, skills and different strategies.

There are different views of what mathematics is all about. This means that teachers may view it differently. These views may have an impact on how teachers teach, and hence how learners learn. All the views have one thing in common at the end of every teaching and learning, and that is solving mathematical problems. Wyndhamn and Saljo (1997) argued that the development of problem solving skills is an important aim in mathematics teaching. On the other hand problem solving is also seen as a decisive test of genuine skill and understanding of what mathematics is all about. Failure to solve problems in mathematical situation means failure to enjoy the status of what mathematics is all about. Knowing how to solve problems is the principal reason or cornerstone for successful learning in mathematics situation. For me, without solving mathematical problems, Mathematics cannot have a meaning and sense at all.

Solving problems in Mathematics forms an important part of Mathematics in the teaching and learning situation. Indeed, if there are no problems to solve then there would be no need to teach and learn Mathematics. In problem solving, there is a broad range of mathematical problems such as numerical problems, geometrical problems, algebraic problems, word problems, graphical problems and others. Some of these problems need straight and simple computation based on one topic. On the other hand, some of the problems are tied to more than one topic which may need a range of strategies and different skills in order to solve them. However it is important for Mathematics educators to teach different types of problems for the purpose of equipping learners with good understanding and appropriate mathematical knowledge and skills, although these broad ranges of problems are not taught at the same time and even the ways of solving them are different.

A very important aspect in solving any different type of problems as mentioned above, is reasoning and thinking. Sahni (2007:72) showed that reasoning is used to think through a question or problem and come up with a meaningful and useful answer. She further indicated that reasoning and thinking are major parts of problem solving, particularly in situation where Mathematics is involved. Any step one takes is followed by mathematical reasoning or justification; otherwise the step without a mathematical reason behind is meaningless. Furthermore, problem-solving is the process of applying previously acquired mathematical knowledge to new mathematical matter. This suggests that the new matter cannot be meaningful and understandable without a link or the recognition of the previous matter. It also applies when solving problems in Mathematics. In order to be successful in any type of problem-solving, one needs to know the previous matter together with its rules and procedures. Acquisition of proper mathematical knowledge is measured by the extent a learner can go when solving problems. I therefore regard problem solving as the heart of Mathematics teaching and learning.

The main issue in a Mathematics classroom situation is that it is as important to teach Mathematics as it is to learn it as a subject. After all, the value and the beauty of Mathematics lie in solving problems. Solving problems in Mathematics situations is the key to unlock the doors to know and to understand what Mathematics is all about (Setati, 2002). Furthermore, it also assists learners in solving everyday problems. Although solving problems in Mathematics classroom situation, learners need to be able to apply the rules of logic necessary to arrive at valid conclusions or correct answers. Spring (2002) has already mentioned that there are broad ranges of mathematical problems.

The study focused on one range of mathematical problems and that was mathematical word problems rather than problems written in numbers and operations which are referred to as numerical problems. Word problems consist

of processes beyond mere manipulation of symbols and operations for getting the right answer. The main objective of giving learners word problems to solve is to enable them to develop new knowledge. As a Mathematics educator, I found that word problems play an important role in the Mathematics curriculum and for the meaningful teaching and learning of Mathematics. The curriculum document suggests that word problems is something that teachers need to teach in all grades. Stoker (1992:20) stated that "Good teachers attempt to provide an environment that promotes word problem solving development". In addition, a good understanding of word problems is the key to unlocking the door to successful performance in Mathematics. Malloy and Jones (1998:115) emphasize that understanding of word problems is seen as an important test of mathematical ability.

In any classroom situation the teacher is a key figure to develop the kind of learner that is needed in the modern society. The success and failure of learners depend mostly on the teachers rather than learners themselves. Rowland et al. (2000) found that teachers without pedagogical content knowledge, curriculum knowledge and subject matter knowledge are likely to perform poorly in Mathematics teaching and learning situation which results to learner's poor performance in mathematics.

Delpit (2003) and Ogbu (1992) have indicated that South African learners receive poor mathematical experiences and results in schools due to different factors such as learner factors, lack of interest, negative attitudes and many others. Regarding teacher factors for example, teachers are not available for extra help, lack of mathematical knowledge and experiences. Teachers were the main contributing factor to poor performance in Mathematics. Evidence to teacher factor can be seen in teachers emphasizing memorizing facts and procedures to learners. In this regard, learners will be less likely to use meaning making in solving word problems.

transitional level. A learner in Grade 5 is in transition from relying on concrete

Different studies such as Sahni (2007); Spring (2002) and others showed that the poor performance of learners in mathematics is mainly due to word problems than numerical problems. They further indicated that difficulties of learners with solving mathematical word problems exist not only in primary schools but also in secondary schools. These difficulties are partly due to using both mathematical words and the language of teaching and learning which is not the learners' first language to solve word problems simultaneously. This leads to a restricted mathematical understanding of the whole problem.

Learners' difficulties with word problems are also well identified by other researchers (Saljo & Wyndhamn, 1997; Sahni, 2007). The discrepancy has been mainly attributed to their proficiency in the medium of instruction which happens in English and mathematical words which hold different meanings to everyday usage. Many learners said that English language made them feel comfortable. They failed to express themselves in the language clearly, and could not ask questions and participate fully in the class. They also found it difficult to understand mathematical concepts. It is against this background that I intend to investigate more difficulties that learners' experience when solving word problems in Grade 6 level, particularly among learners where English is their second language.

The education system in South Africa is presented in bands and phases. The General Education and Training Band represents the basic education and comprises of three phases. The school entry phase is called the Foundation Phase and covers Grades R-3. This is followed by the Intermediate Phase starting from Grade 4 to Grade 6. The last phase in this band is the Senior Phase and this covers Grades 7 to 9. The reason why I have selected Grade 6 level is because it is the end level of Intermediate Phase and again it serves as the beginning of the Senior Phase. Learners in Grade 6 can be said to be in the

transitional level. A learner in Grade 6 is in transition from relying on concrete thinking and representations to being able to function in a more abstract fashion. So to ignore him/her would not allow the development of moving from one mode to another. For me this is the level which needs more attention.

## **1.2 STATEMENT OF THE PROBLEM**

Different people and Mathematics educators hold different views of what Mathematics is all about. Other people view Mathematics as working with numbers, operations and symbols in order to solve mathematical problems, whereas others view it as memorization or collection of rules, facts, formulas and procedures for solving problems in classrooms. These views may have an impact on how teachers teach Mathematics and hence how learners learn Mathematics. As Mathematics educators, it is very important to understand how we view Mathematics in order to understand how to teach it and how learners might learn it successfully with understanding. Understanding is regarded as a major prerequisite for any good performance or achievement in the teaching and learning situation.

There is inadequate information on the difficulties that learners experience when solving word problems particularly at Grade 6 level. This study therefore seeks to investigate difficulties and factors that influence poor performance in solving word problem in Mathematics. Learners' difficulties with word problems in Mathematics will need to be addressed early before they develop into major problems or difficulties for the next phases, namely, senior phase and above. This then means that learners will need ongoing support to develop their mathematical understanding in solving word problem for the sake of better or good performance in word problems, and hence in mathematics in general.

The major focus of this study was to investigate challenges Grade 6 learners experience when solving mathematical word problem rather than solving numerical problems. The reason why the study was more concerned with the challenges in the aspect of solving word problem was due to the fact that there is a long pending problem of poor performance in solving word problems in Mathematics in primary schools (Spring, 2002). Therefore the causes of the difficulties need to be identified and possible solutions suggested as soon as possible otherwise the value and the meaning of Mathematics in general will fade away. Spring (2002) showed that learners are supposed to solve word problems in the early years of their primary school course; as early as possible for the purpose of developing learner's understanding.

Research has been done in the aspects of solving word problem but it is worth conducting more research in order to find out more causes. It is therefore important to do so because persistent lack of knowledge about the difficulties may lead to prolonged poor performance of the learners in solving word problems. This might also lead learners to frustrations and loss of interest when they go or enter the next phase of education. Poor performance in the aspects of solving problems in primary school has been well documented in different studies such as (Sahni, 2007; Howie, 2003; Saljo et al. 2007).

### **1.3 PURPOSE OF THE STUDY**

The main purpose of the study was to investigate the challenges and factors which hinder Grade 6 learners from solving mathematical word problems. This was particularly looking at the influence of both the language of instruction and mathematical language.

## 1.4 OBJECTIVES OF THE STUDY

The objectives of this study are, therefore:

- 1.4.1 To investigate challenges which Grade 6 learners experience when solving mathematical word problems.
- 1.4.2 To determine whether Grade 6 learners experience challenges when solving mathematical word problems as a result of English language deficiency, poor problem solving skills or both, or any other factors.

## 1.5 RESEARCH QUESTIONS

The following research questions were addressed:

5.1 What challenges do Grade 6 learners come across when solving word problems in mathematics?

5.1.1 Do learners experience challenges as a result of English deficiency?

5.1.2 Do learners experience challenges as a result of poor problem solving skills?

5.2 What other factors give rise to challenges and difficulties that learners experience when solving word problems.

## 1.6 BEGINNING ASSUMPTIONS

Mathematical word problems demand more than solving different kinds of problems that are found in mathematics such as geometrical, numerical and many other problems. Mathematical word problems cause challenges to all

learners in both primary and secondary levels (The National Council of Teachers of Mathematics, 1989). My experience shows that solving word problems in Mathematics classroom situation is an essential element of successful Mathematics teaching and learning because solving word problems offers a powerful context in which learners go beyond memorizing facts, rules and procedures, into applying mathematical knowledge and different strategies to arrive at the correct answers.

On the other hand, other teachers may take the same organization differently,

Again, word problems require learners to apply and construct mathematical knowledge to a realistic problem situation in constructing their knowledge to a realistic problem situation in which mathematical reasoning and thinking become the most important instruments or tools for arriving at the right solution of the problem.

Learner's challenges and difficulties in word problems are related to a number of factors (Brodie, 2002). These include poor reading, interpreting and understanding the meaning of mathematical words and the language of teaching and learning mathematics which in this case is English. Everyday language and the concept of mathematics as a language, differ in many ways. Like in any other languages, mathematics has its own brand of technical terminology which differ in everyday usage such as the words difference, roots, product and others (Adetula, 1990). Failure to interpret and understand mathematical meaning of words correctly may cause difficulties when solving word problems. Learners are unable to transfer problem context to mathematical contexts in word problems. Thus to be able to teach more effectively as teachers, we should try to diagnose learners' difficulties.

When word problems are related to everyday life then it becomes easy for the learners to understand the problem and succeed in

Different studies indicated that word problems are more demanding and difficult than straight computation and this causes challenges and difficulties to both teachers and learners in mathematics classroom situation (Setati,2002; Howie,

2003; Sahni, 2007). According to Saljo et. Al, teachers' challenges are related to the way in which word problems are organized in Mathematics textbooks. In many Mathematics text books, word problems are presented at the end of the chapter. This organization to some teachers may suggest that word problems are not so important to teach and they do not take them as an important aspect or topic in the teaching and learning of Mathematics.

On the other hand, other teachers may take the same organization differently, where presenting word problems at the end of every topic may suggest that word problems in their own right are difficult as a result of which they do not teach them at all. This might suggest therefore, in this regard, that teachers lack sufficient mathematical knowledge and skills about teaching and solving word problems.

My assumptions of why learners' performance in solving word problems is very poor can be summarized as follows:

- *Teacher's perception and attitude towards the teaching of word problems.*  
In most textbooks word problems are presented at the end of the topic and therefore teachers regard them as if they are not important in the teaching and learning of Mathematics.
- *Word problems are not set in context of learner lived experiences or learners every days lives.* Word problems need to be focused far more on real life problem solving than on abstract contexts which do not make sense to learners. When word problems are related to everyday life then it becomes easy for the learners to understand the problem and succeed in solving the problem.

- *Language proficiency, since the language of teaching and learning mathematics is seen as a serious contributory factor for poor performance in the aspect of solving word problem.* Vernon (1969) argues that if a learner does not acquire skills in language used, he/she is inevitably retarded in reasoning as well as in attainment. If the learner does not understand the language in which Mathematics is taught it will be difficult for a learner to follow the instructions and procedures, more-over to understand what the problem requires him/her to do.
- *Solving word problem is demanding on the learners:* Learners are often stretched simultaneously by the Mathematics they are struggling to learn and on the other hand by the need to learn English as the language of teaching and learning which is not their first language. This then suggests that learners are learning Mathematics through a language they are still learning. In other words learners are learning two aspects which are unfamiliar to them at the same time.

## **1.7 SIGNIFICANCE OF THE STUDY**

This study is designed to investigate the challenges that Grade 6 learners experience when solving word problems in Mathematics. Mathematical word problems are a core aspect in the teaching and learning of Mathematics in general. Recent studies demonstrated the importance of solving mathematical word problems in the primary school curriculum to develop learners' understanding of how to apply solution strategies to real life experiences (Verschaffel & De Corte, 1997). Evidently, for learners to be successful in solving any type of mathematical problems, there are some procedures and instructions that they have to follow written in words rather than symbols and signs.

Understanding of these procedures and instructions result in good performance in mathematics teaching and learning situation.

The study is significant for a number of reasons or in many ways:

Firstly, it is believed that the findings of the study will provide a better understanding of the difficulties from the perspective of the learners themselves for meaningful and effective teaching and learning to take place. It is of importance to take into account learner's difficulties, feelings and beliefs that they hold in order to develop good methods and strategies for teaching and solving word problems.

Secondly, findings of the study will assist Mathematics teachers to understand some of the difficulties that Grade 6 learners experience when solving word problems to enrich teaching practice.

Thirdly, it is also hoped that the findings will influence policy makers, curriculum designers, in-service programmes in the development of curricula, teaching and learning materials for teaching word problems in a meaningful way to learners, for the purpose of improving learner's performance in solving mathematical word problems.

Fourthly, it will enhance my teaching and learning of mathematical word problems. This means that my teaching and learning of word problems will not be the same again, as new methods and strategies will be applied and used.

Lastly, the findings will hopefully be useful in stimulating further research in the aspect of word problem in Mathematics so that Mathematics teachers can take into account the importance of teaching mathematical word problem in the

classroom situation as an important aspect in the Mathematics curriculum and Mathematics in general.

## **1.8 DIVISION OF THE RESEARCH CHAPTERS**

The chapters of this study are as follows:

### ***Chapter 1: Introduction and Background to the Study***

It gives the motivation for the study, statement of the problem, beginning of assumptions, critical questions and significance of the study.

### ***Chapter 2: Review of Literature***

This section contains a review of literature on different studies about solving mathematical word problems. The section is subdivided into:

- Problem solving in Mathematics
- Mathematical language
- The relationship between mathematics and the language of teaching and learning Mathematics.

### ***Chapter 3: Research Design and Methodology***

This section shows how the study was conducted. This implies the methods and techniques used in order to answer the research questions posed by the study in the first chapter.

## **Chapter 4: Data Analysis and Interpretation of the Results**

This was a discussion of the results in the written test. The results were analysed and interpreted critically in order to identify the difficulties that learners experienced when solving word problems.

## **Chapter 5: Conclusion and Recommendations**

This is a section which gives the suggestions and recommendations of the whole study.

## CHAPTER 2: LITERATURE REVIEW

### 2.1 INTRODUCTION

The chapter looks at the theoretical framework which informs the overview of the study and literature review which informs how the study relates to previous studies and also gives the overview of solving mathematical word problems in primary level. Literature was reviewed thematically as follows:

- 2.1 Theoretical framework.
- 2.2 Problem solving in Mathematics.
  - 2.2.1 What is Mathematics?
  - 2.2.2 The issue of language in Mathematics classrooms.
  - 2.2.3 What is problem-solving?
  - 2.2.4 The importance of problem solving.
  - 2.2.5 Word problems.

### 2.2 THEORETICAL FRAMEWORK

Theories of learning and teaching Mathematics are important aspects of teacher's knowledge contexts. As Mathematics teachers, our knowledge, ideas, attitudes and beliefs about what Mathematics is all about, how we teach it and how learners learn it directly, affect what we do in our Mathematics classroom situations. Sometimes this happens at a conscious level and sometimes it happens at an unconscious level. At a conscious level, we might say that learners are supposed to do many Mathematics examples because practice makes perfect or we might say that because word problems are difficult to solve we should try to avoid teaching them in our classroom situations. At the unconscious level we may hold the belief that Mathematics consists mainly of definite sets of rules and

procedures which learners might learn by imitation or memorization in order to solve different types of mathematical problems.

This study is informed by the constructivist theory of teacher Piaget (1979). This theory makes assumptions about knowledge, the learner and learning.

Knowledge:

- Knowledge arises from the interaction between experience and our current knowledge structures. Developing mathematical meaning through the use of everyday experiences helps learners to build confidence. Confidence comes about by reasoning the familiar in the new. Learners should therefore encourage linking their everyday experiences to the learning of mathematics. Everyday experiences played a crucial role in the development of mathematical knowledge and understanding.
- It is not possible that knowledge can be transferred ready made from one person to another. The construction of knowledge requires that both teachers and learners put their ideas into words so that they can be shared.

The learner:

- The learner is an active participant in the construction of his own knowledge. Learners who construct their own knowledge for themselves learn better, because they work actively to construct or develop their own mathematical rules, ways and problem solving strategies. As learners develop their own problem solving strategies they experience increasing success with solving word problems. They also gain the confidence to use their skills to solve different mathematical problems in Mathematics classroom situations. Therefore they enjoy Mathematics more because they can develop their own ways of solving problems which they understand much better and at their own level of ability.

meanings develop. Murray is the study, learners come to the classroom with

- The learner brings a wealth of valuable experiences to any learning situation. Learners who learn Mathematics successfully bring to it a range of experiences, skills and understanding which they will use to make sense of the problems they are solving.
- Learners do not only interpret knowledge but they organize and structure this knowledge into large units of interrelated concepts.

Learning: Davis argued that Mathematics is not only about performing operations

In reality, learning is a most personal activity which takes place inside the mind. It is a complex activity and as such different methods must apply or practiced to ensure effective learning.

problems which needs mathematical knowledge and problem solving skills are

- Learning involves the interaction between the learners existing schemas and new ideas. Therefore learner's current knowledge is important to learning.

My experience as both a Mathematics teacher and a learner revealed that

This study aims at investigating difficulties that learners experience when solving mathematical word problems. The fact that learners experience problems when solving word problems suggests that there must be problems inherent in the Mathematics teaching and learning. Thus poor performance in solving word problems can be attributed to the difficulties learners experience in the teaching and learning of word problems.

around these numbers, operations and symbols. I therefore argue that meaning

Vygotsky (1962) has shown that construction of true concepts and the meanings of words is possible and assessable when one is able to connect previously acquired knowledge and new ideas. According to Vygotsky, a person needs both spontaneous and non-spontaneous true concepts and the meaning of mathematical words. He argues that it is through interaction between spontaneous and non-spontaneous knowledge that true concepts and true

meanings develop. Relating to this study, learners come to the classroom with everyday meanings of words such as difference, product, decrease and many others although they cannot translate them in mathematics context or mathematical meaning.

Research in Mathematics Education has shown that many people think that Mathematics is only about manipulating symbols, operations and numbers (Brodie, 2002). Davis (1988) and other Mathematics educators argued against this view. Davis argued that Mathematics is not only about performing operations on numbers and symbols to get the right answers or solutions. Rather, it is also about finding questions which can then be answered by using mathematical knowledge, understanding and skills. The example of such type of questions or problems which needs mathematical knowledge and problem solving skills are problems written in a form of statement or words than symbols and numbers only.

My experience as both a Mathematics teacher and a learner revealed that learners and even teachers do not see word problems as a part and parcel of Mathematics that can be taught and learnt in Mathematics classrooms. However, they see Mathematics as manipulation of numbers and symbols only. Through furthering my studies in Mathematics Education, I am also against this view as Davis stated in his studies. I believe that dealing only with manipulation of symbols, operations and numbers can be meaningless if there is no word around these numbers, operations and symbols. I therefore argue that meaning in Mathematics comes from understanding the meanings of symbols and operations represent and their relationships between these operations. As Mathematics educators we should encourage our learners to work with the meaning of mathematical symbols, operations and ideas, rather than only doing manipulations of symbols and operations on numbers.

Most educators and learners throughout the world probably focused on the calculations of numbers and symbols only. McNeil's (1995) has seen how Mathematics can be experienced by a learner as profound and beautiful when it makes sense to her/him, and as disappointing and disillusioning when it is presented as meaningless, when it does not make sense to the learner. One way in which Mathematics can be given meaning is to present it in the form of words or statements than in numbers and operations. In this regard learners should be encouraged to solve word problems which require them to think and to reason critically. and then trying to find the answers. By doing this they realized what mathematics is in fact.

The sense, value and the meaning in Mathematics is based on solving different mathematical problems such as numerical problems, geometrical problems, graphical, algebraic problems, word problems and many others. The reason why learners are taught to solve different problems in Mathematics is to equip them with appropriate mathematical knowledge, understanding and problem solving skills. Moreover solving problems in Mathematics classrooms is not for the sake of tests or exams only, but it is also for the sake of solving problems in everyday situations. It is important that learners experience a wide range of problems. These problems should be meaningful to the children. Mathematics is seen as not just something that happens in Mathematics classrooms but as having a variety of applications in everyday life. Problems in general, form a crucial part of our everyday lives. Mathematics is not isolated knowledge, skills and procedures rather it is seen as a social construction within the social practice of Mathematics as a learning subject (Lange, 2007). After all Mathematics is everywhere and most of what we see around us is a combination of different concepts of Mathematics. The interesting fact about mathematics is that it includes everything that we do in everyday life experiences. When we try to understand anything or everything that we do in our day to day lives, we use Mathematics unconsciously and unawarely in different transactions and operations, but when it comes to the classroom situation it is very difficult for both the teacher and

learner to rationalize and comprehend different operations of Mathematics (Sahni, 2007).

Mathematics is used daily by almost all the people, whereas it is studied or learnt professionally by a small number of people or scholars called mathematicians. These two groups constitute a community because they share what is called mathematical knowledge (Brodie, 2002). Mathematicians do not only answer questions posed by others, they also spend a lot of time formulating their own questions and then trying to find the answers. By doing this they realized what mathematics is in fact.

As it has already been mentioned above, learners are taught to solve different problems answers. The study focused on solving one type of problem which consists of reasoning in mathematics classroom for the purpose of acquiring good mathematical knowledge and skills. Furthermore these problems are not taught at the same time and the ways of solving them are also different. Some of the problems consist of reasoning processes and a range of strategies beyond mere manipulation of symbols or getting the right answers and some questions require specific answers. This study will then focus on solving one type of problem which is mathematical word problems rather than any type of problems mentioned above. Recent studies demonstrated the importance of including mathematical word problems in the primary school curriculum (Verschaftel & De Corte, 1997). Word problems enable the learner to experience the joy and struggles of mathematics and also to realize that mathematics involves reasoning and thinking which requires more than manipulation of symbols.

Learners tend to see word problems as one of the most distasteful and anxiety tasks in Mathematics classrooms and that can be the reason why their performance in solving word problems is poorer than in solving numerical problems. Because word problems are so difficult for learners to solve them and

hence they play a crucial role in mathematics instruction, it is therefore important to seek improved ways of constructing them and also better strategies, methods, techniques of teaching them (Schoenfeld,1985). It is against this background that I intended to investigate difficulties in Grade 6 learners experience when solving word problems. I hope that the findings from this study will be helpful in many ways. It is also interesting to consider the findings on research done by Spring (2002) which indicated that learners difficulties on solving word problems is related to reading and understanding the meaning of mathematical words. Difficulties in word problems are often attributed to general reading difficulties – poor vocabulary, inability to decode unfamiliar words, and poor reading comprehension. This will illustrate the importance of investigating more difficulties that learners experience in the aspect of solving word problems. Research has shown that word problems have a reputation in Mathematics Education as presenting difficulties for all learners in primary and secondary levels (Verschaffel, 2000).

Different researchers have shown that learners are found to have considerable difficulty in solving problems written in words than written in numbers, operations and symbols. The difficulties raised are due to the use of English as the language of teaching and learning Mathematics and mathematical terminology or language (Third International of Mathematics and Science, 2000; Barwel, 2004; Berry, 1995; Spannersberg & South Wood, 1991; Fuys & Tischler, 1990; Howie, 2003).

Researchers such as Delpit (2003) and Ogbu (1992) showed that South African learners receive poor mathematical experiences in schools due to different number of factors. Evidence to this effect can be seen in the classroom situation when teachers emphases are based on encouraging learners to memorize facts, rules and procedures for solving word problems rather than encouraging learners to make sense of the mathematics they are learning so that learners can

construct their own knowledge in their own unique ways in order to get the required answer or solution for that particular word problem.

Many researchers, for instance Howie (2003), Sohng (2002) and Setati (2005) have shown that English proficiency is a contributing factor to the difficulties that learners have in Mathematics, particularly in word problems. However, other researchers have suggested that a crucial factor for successful performance in any classroom situation is the teacher (Setati 2005; Barwell 2004; Vorster 2005), because what directly determines the instruction that takes place behind the classroom door is the teacher rather than external educational agenda or any other requirements. The findings from these mentioned studies found that teacher's beliefs and knowledge play a critical role in learner's performance.

Hart (1981) argues that in Mathematics classrooms, the main point is that good teaching of word problems develops learners into competent, productive, confident and independent members of the modern society. This then suggests that good teaching of word problems is essential in Mathematics teaching and learning situations. Spring (2002) showed that good understanding of word problems in the learning and teaching of Mathematics is the key to unlock the doors of successful achievement in Mathematics.

One way to teach this goal as set by the National Curriculum Statement is to teach learners how to solve word problems in Mathematics classroom situation.

The purpose of this study is to extend the research findings made by other researchers such as Howie et al. (2003), and many others by investigating other difficulties that learners experience when solving word problems at Grade 6 level.

## 2.3 PROBLEM SOLVING IN MATHEMATICS

Problem solving in Mathematics is a transfer challenge requiring learners to develop schemas for recognizing novel problems as belonging to familiar problem types for which they know the solution (Summer, 2004). It therefore requires learners to apply skills to novel problems. Mathematical problem solving has been defined as the ability to read and solve mathematical situations (Sohnge, 2002). However, most mathematical problems are relegated to imitation of procedures. If learners are trained to excel in Mathematics through imitation and memorization, they will be unable to make meaning of mathematical word problems. This means that their procedural orientation could prevent them from initially succeeding in Mathematics classroom situation.

Mathematics is one way we make sense of things. It enables us to see patterns.

By problem-solving in Mathematics, it is meant that approach in mathematics where learners relate to everyday problems and use the skills and knowledge acquired previously to solve them, which will enable them to interact with the learning and solving of mathematical problems meaningfully and effectively. The concept of problem solving in Mathematics encompasses quite a number of processes, for example: analyzing, investigating, developing, alternative solutions and generalizing results. The section on problem solving in mathematics in this study is divided into two headings which are in the form of questions: what is mathematics and what is problem-solving?

### 2.3.1 What is Mathematics?

The term Mathematics has been defined in many various semantic and synthetic patterns. The definitions given below try or tend to embrace in a broad sense all the different views about what Mathematics is, given in Chapter 1. The complexity of viewing Mathematics is described by Stoker (1992) when he

referred to Mathematics as the need to engage in creative thinking and reasoning when solving different mathematical problems. Other definitions of mathematics were proposed by the following studies: Orton (1987) defined mathematics as a discovery of relationship and expression of the relationship in symbolic (or abstract) form. This is not a static definition, but implies action on the part of the learner, of whatever age or ability. It is the fact that mathematical meanings and structures can be discovered and communicated in a variety of ways that put Mathematics within reach of learners and adults of all abilities.

The reader's Digest Oxford Word Finder (1993) defined Mathematics as the abstract science of numbers, quantity and space studied in its own right whereas the Oxford School Dictionary (2005) defines Mathematics as the study of numbers, measurements and shapes. According to O' Connell (2000), Mathematics is one way we make sense of things. It enables us to see patterns, to comprehend data and to reason carefully. If teachers want learners, to see and enjoy Mathematics as a subject which makes sense to them, they should be given problems which are linked to something in which they are familiar or interested. In addition, these problems should allow learners to explore different types of solving mathematical problems. Mathematics can therefore be seen as meaningful rather than meaningless, as enjoyable rather than disillusioning when you are able to motivate or justify your answers or statements.

The study of Mathematics is formed by the truth or beauty and utility or application which is based on thinking and reasoning. Mathematical thinking and reasoning are crucial aspects of Mathematics. Curriculum 2005 emphasized mathematical reasoning as the most important aspect in the teaching and learning of Mathematics. The curriculum and evaluation standards for school Mathematics document suggested that mathematical thinking and reasoning is something that teachers need to teach in all phases, not only at higher levels. In addition, Sayers (1991) indicated that mathematical thinking is what

mathematics does and includes process such as investigations, analyzing, interpreting and problem-solving.

The ability to reason is not only important in Mathematics situation, but it is also an important life skill in its own right. Every experience needs someone to think and reason carefully and critically in order to enjoy the benefits of this world. Again, Mathematics is not learnt for the sake of tests and examination purposes. Rather it is learnt to assist people to solve different problems on a daily basis in their lives. Problems are part of our daily lives and there is no way or means to run away from them except to solve them. Good problem-solving skills are acquired in mathematics classroom situations than in any other classrooms that one can think of. This then suggests that Mathematics is an important subject that can be learnt by every learner in all phases (Sahni, 2007).

Mathematics serves as a foundation for advancement in technology by claiming that living a normal happy life in this world requires everyday use of Mathematics (Mayer, 2003). To survive in this modern world, requires someone to have the ability to use Mathematics with ease and confidence. The usefulness of Mathematics in everyday life is undeniable and undebatable. On daily basis, we use Mathematics unawaresly. Mathematics is therefore a powerful tool for understanding and describing the world (Orton, 1987; Readers Digest Oxford Word Finder, 1993; Oxford school dictionary, 2005; Moschovich,2002 ; Howie ,2001; Lemmer, 2002). Therefore, I draw my definition from the above definition. Mathematics therefore is an everyday activity or game that requires an active or critical thinking which requires justification and motivation of your answers. In other words, Mathematics does not end up with a yes or a no answer, true or false, correct or incorrect without the reason why around it. Failure to give the reason why means failure in understanding what mathematics is all about.

Mathematics enjoys the status of a major teaching subject and is generally assigned the highest importance for developing science and technology and hence for social welfare. It is at the same time held to be accessible to only a small percentage of learners. Learners therefore require a strong tertiary grounding in mathematical knowledge, skills, and appropriate methods to Mathematics teaching and learning. The reason why learners are supposed to learn Mathematics is because in South Africa there is a serious shortage with people who have mathematical skills careers.

### **2.3.2 What is problem solving?**

Different studies define problem solving as follows:

Saljo and Wyndhamn (1997) define word problem solving as the ability to read, process and solve a mathematical situation. Summer (2004) define problem solving as a transfer challenge which requires learners to develop schemas for recognizing the novel problems as belonging to familiar problem types for which they know the solutions. Whereas Spannersberg and Southwood (1996) define problem solving as the ability to use and apply mathematics in a variety of situations. All these definitions suggest that problem solving as the search for, and success in finding solutions. In other words, it not just a remembering of the situations of the other people; rather it is discovering one's situation or answer to a problem.

According to Southwood and Spannersberg (1991), problem solving is the search for and success in finding solutions to a problem. It is not therefore, remembering the solutions of other people, but discovering one's own solutions. Instead of learners being given instructions and procedures by the teacher on how to solve the problem, learners are therefore encouraged to think through a problem for themselves, using, applying and building on previous mathematical knowledge and experience in order to develop strategies for the solution of problems. Problem solving in mathematics classrooms is a central issue and it

gives the value and the meaning of what mathematics is all about. Davis argued that mathematics is not only about performing operations on numbers to get the right answers. Problem solving is a process in which solutions results from:

- Exploring the problem;
- Understanding the problem; and
- Devising and testing strategies.

A crucial question in the aspect of problem solving is: What is a “problem”? People see a problem and exercise as two words which are used interchangeable whereas they are not. A problem and an exercise hold different meanings, but they are related to each other. A question can arise: What is an exercise? According to Frobisher (1994) an exercise is a call up attention in the subject matter where the solution is immediately accessible and it can be found by immediate applications of some known algorithm, whereas a problem cannot be found immediately. The two are related to each other in the sense that an exercise can be on the solving of problems than writing an exercise. The National Council of Teachers of Mathematics (NCTM) Standard Documents (1989, 2000) call for the teaching of mathematics as problem solving. The Oxford Dictionary (2001) defines a problem as “doubtful or difficult matter requiring a solution”. Malloy and Jones (1988) define a problem as a matter that exercises the mind by finding an answer or solution to a problem. Furthermore, Pimm (1991) defines a problem as a challenge that one has to think about in order to find out the right answer or solution. The common feature in all these definitions is to get the solution to a problem.

My understanding of what a problem is derives from the definitions mentioned above. Therefore, I can define a problem as a means or a way of applying mathematical knowledge, rules, symbols and operations that one acquires differently in mathematics classroom and use them simultaneously. We teach different topics at the different time intervals. But when we come to assessment,

learners are assessed in different topics at the same time. Learners are therefore encouraged to think for themselves, using, applying and building on different knowledge and experiences in order to develop methods and strategies for arriving at the solution of a problem.

It is already mentioned above that in a problem solving greater emphasis is placed on the arriving at the solution to the problem rather than on the solution itself. Using problem solving approach to teach and learn mathematics can provide an alternative learning environment where learners are active participants as they are able to construct or formulate concepts on their own as they go through problem solving processes. By problem solving approach it is meant that approach in mathematics where learners relate to everyday problems and use the knowledge and skills acquired to solve them, which will enable them to interact with the environment meaningfully and effectively. The study is then focused on problems rather than exercise. Moreover, it is important that learners should experience a wide range of problems. This study is then focused on word problems rather than any type of problems in mathematics context such as algebraic problems, numerical problems and many others.

### *2.3.2.1 The importance of problem solving*

The ability to use problem solving approach in mathematics classrooms, particularly in word problems, is the key for successful achievement in mathematics as a whole. The overall agreement amongst psychologists and mathematics educators is the fact that problem solving, among other process approaches offers a powerful context in which learners can construct their own knowledge differently (Orton, 1994; Cockcroft, 1982). Using problem solving to teach and learn mathematics can provide an alternative learning environment, where learners are active participants. Consequently, they are able to construct or formulate concepts on their own as they go through problem solving processes. In addition to learning concepts, learners would acquire process skills which could result in them being empowered to attack new or unfamiliar material

or concepts. The success of problem solving approaches hinge on the ability of a teacher to play his role as facilitator, enabler, observer, collaborator and many others. Polya (1969) claims: "If a teacher has no experience of creative work of some sort, how will they be able to inspire, lead, help, or even recognize the creative ability of their learners?" According to me, problem solving is the heart of teaching and learning mathematics.

The purpose of the study is to extend research findings such as (Fuys & Tischler, 1979; 1984; Salyo & Wyndahnm, 1997) by investigating more difficulties that learners experience when solving word problems. Their findings showed that learner's difficulties in solving word problems involve poor reading and computation or both. Poor reading involves poor language. Language will be discussed deeply in 2.2 of this section. This concurred with a study by Brown (1985) which revealed that learners in the primary school level experienced difficulties when solving word problems, and they were not confident in solving them due to lack of understanding the language. As mentioned above, learners perform better in numerical problems than word problems.

### *2.3.2.1 The importance of problem solving*

According to Wyndhamn and Saljo (1997), problem solving is important in mathematics and the development of problem solving skills is an important aim in mathematics teaching and learning. This then suggests that without problem solving, mathematics would be meaningless and without value. Problem solving is regarded as a decisive test of genuine skill and understanding. Setati (2002) emphasized the aspect of problem solving in her studies as an important aspect. Learners are expected to solve problems in mathematics classroom. Without problem solving, the value and the meaning of mathematics cannot be seen at all.

Summer (2004) argues that problem solving is one of the most central aspects of mathematics teaching and learning. Moreover mathematics educators and mathematicians cited problem solving as the goal of teaching and learning mathematics. In support of this view, the national council of teachers of mathematics (NCTM 1989), mentioned that mathematics education should aim to help or enables learners to:

- Developing learner content knowledge;
- Learn the value of mathematics;
- Become confident on their ability in mathematics;
- Become mathematical problem solvers; and
- Learn to communicate mathematically.

All the aims of Mathematics Education mentioned above can be achieved through problem solving. This suggests that problem solving is a crucial aspect in the teaching and learning of mathematics in all phases.

There is an overall agreement among Psychologists and mathematics educators that problem solving offers a powerful context of which learners construct their own knowledge in their own unique ways (Orton, 1994; Cockcroft, 1982). In the UK, similar goals have been adopted. Cockcroft (1982) reported that the ability to solve problems is at the heart of mathematics, and that mathematics is meaningful and useful when it cannot be applied to various situations. Again NCTM (2000) calls for the teaching of mathematics as problem solving. The outcomes to mathematics instruction include 'investigating and understanding mathematical content (NCTM, 1989). Solving problems is not only a goal of learning mathematics but also a major means of doing so. In addition, problem solving can and should be used to help learners to develop fluency with specific skills (NCTM, 2000 p.52). The importance of problem solving is more than mathematics itself.

Furthermore, it added more benefits in the value, sense and meaning of what Ollerton and Mike (2007) in his study, "Teaching and learning through problem solving" suggested five keys criteria which are more or less like those suggested by NCTM (1989) mentioned above that are involved in the setting up of the stage of problem solving

They are:

- Developing learner content knowledge;
- Finding accessible and puzzling problems;
- Using "open" question;
- Extension tasks; and
- Fostering independent learning.

O'Connell (2000) posited that problem solving helps learners to make sense of mathematics in various situations. The researchers argument is that the value and the beauty of teaching and learning mathematics depended on problem solving than anything else if the teaching and learning of mathematics takes place effectively. Furthermore she sees problem solving as a mirror to see whether the teaching and learning and learning of mathematics take place effectively. Problem solving in mathematics classrooms is therefore specialized and used to guide teachers and learners activities which lead to the acquisition of appropriate knowledge and understanding. Again, problem solving is a powerful tool of motivating learners who are not actively in the lesson. Hence it also serves as a tool of motivating learners who are actively involved in the lesson as a step forward to the other subject matter.

The history of mathematics shows that, even as far as Plato's time, learning mathematics was reviewed as a way or means of improving and developing one's ability to think and to reason. According to the researcher' point of view, problem solving complements teaching and learning in mathematics classrooms.

Furthermore, it added more benefits in the value, sense and meaning of what mathematics is all about. It is of importance to be even more precise in explaining mathematical ideas in writing form rather than talking to someone.

It is desirable that a teacher should be an expert in mathematical problem solving and have deep and connected mathematical knowledge (Leikin, 2005). This suggests that teachers' pedagogical content knowledge in general and their knowledge of learners are crucial for productive and creative mathematical discourse to take place in mathematics classrooms. In problem solving, greater emphasis is placed on the process of arriving at the solution rather than on the solution itself. It's also important to consider the fact that problem solving is not necessarily a linear or step by step process; rather, it can be viewed more realistically as a dynamic and cyclic process.

#### *2.3.2.2. Types of mathematical problems*

It is important that learners should experience a wide range of problems in mathematics classroom situations. The reason why learners should experience a wide range of problems is to equip them with knowledge skills and understanding. O'Connell (2000) posited that solving a wide range of problems helps learners to make a sense of how mathematics can be used in a learner's real life experience. Spring (2002) says that problem context may help problem solvers give meaning to the mathematical content in a problem and that is likely to influence, in particular, the problem solving stages of understanding a problem and planning its solution. Studies such as Boaler (1993), Cooper (1993) and De Lange (1996) focused on connecting mathematics with learners' real life experience.

There are different types of mathematical problems, for instance, numerical, algebraic, graphical and geometrical problems and word problems. The study is

focused on mathematical word problems. Spring (2002) and Wyndhamn et al. (1997) defined a mathematical word problem as a problem which is in the text form or statement rather than written in numbers and symbols. The study focused on the word problems because word problem form an integral part of mathematics instructions. Leikin (2005) described word problems as challenging mathematical tasks or mathematical challenges. According to Leikin, Mathematical challenges means conducting or solving mathematical activities that should be challenging. A mathematical challenge is thus one of the critical features of the quality of mathematical tasks (Leikin, 2005, p. 255). According to the researcher, word problems are more demanding than any other types of mathematical problems. For learners to be able to solve the word problems they should know and be able to use the procedures and instructions that have been written in particular language. This then means that for one to be successful in solving word problems, one has to be proficient in the language used and posses problem solving skills.

only expressed in words which are written in a certain language. The present study is focused on solving word problems which will be presented in English which is the language of teaching and learning mathematics.

The mastery and understanding of word problems in all levels is seen as an important test of mathematical ability. When solving this type of problem (word problem), learners supposedly go beyond rote learning and mechanical exercise to apply their knowledge to realistic problem situations in which reasoning and thinking become important instruments of making concrete judgments (Saljo & Wyndhamn, 1997, p. 361).

Problem solving development because they realize the importance of such environment for their learners. Problem solving in

Studies such as Dickson, 1994; Jooste, 2004; Spring, 2002; Kalejaive, 1995 and Saljo and Wyndhamn (1997) showed that word problems play an important part in primary school mathematics. There is no effort to be spared in teaching them effectively. Learners are supposed to solve word problems in their early years of their primary school course as early as possible. It is evident that the difficulty

for learners in solving this aspect of word problem is due to their inability to read English as the language of teaching (Kalejaive, 1995). The medium of instruction plays a role in poor performance. Kalejaive's study suggests that in order to solve word problems successfully, the teacher must firstly help learners to read and understand the whole problem. This then means that to be successful in solving word problems one requires comprehension and problem solving skills.

Vernon (1969) argued that a learner who fails to understand the problem and does not acquire the problem solving skills for solving word problems results in failure to find out the solution to the problem. Kalejaive (1993) also suggests the steps that can be used in guiding learners to solve word problems properly and successfully. He also argued that learners should be equipped with problem solving strategies and skills and more practice in solving word problems. Word problems involve ideas, and ideas cannot be expressed by means of symbols and numbers. They are only expressed in words which are written in a certain language. The present study is focused on solving word problems which will be presented in English which is the language of teaching and learning mathematics.

Problems solving in mathematics is of importance because it helps learners to solve everyday problems. This means that problem solving does not end in mathematics classroom. It also goes outside the classroom situation to everyday life experience. Stoker (1992) argued that good teachers attempt to provide an environment that promotes problem solving development because they realize the importance of such environment for their learners. Problem solving in mathematics is one of the most central aspects of teaching and learning mathematics (Lange, 2008). Problem solving has the potential of motivating and exciting reluctant learners. It is important that learners should experience a wide range of problems in mathematics classroom. A wide range of problems in the learning and teaching mathematics are: numerical problems, algebraic problems,

geometrical problems, word problems.

Learners are expected to solve this wide range of problems in all phases. The reason why learners are taught to solve different types of mathematical problems is to equip them with an appropriate mathematical knowledge and skills. O'Connell (2000) indicated that solving a wide range of problems helps learners to make sense of how mathematics can be used in learner's everyday experiences or real life experiences. Moreover, it enlarges learner's outlook, to teach them facts, images, ideas, laws, rules, phenomena that go beyond their personal experiences and their everyday lives. The study is more focused on solving word problems rather than any type of problem mentioned above.

## 2.4 WORD PROBLEMS

Brodie (2002) defined word problem as a statement that is written in the form of words, text or statement than symbols, numbers and operations. Mathematical word problems are a concrete material by which it is possible to develop the vocabulary, new terms, association and formulate an overview of learners. Although symbols and numbers are also involved in word problems, they do not dominate. When learners solve word problems, they are forced to move between different linguistic and symbolic codes. In mathematics classrooms, the main aim in the teaching and learning of mathematics is that good teaching of word problem develops learners into competent and productive members of the modern society. One of the challenges of teaching mathematics is to develop learners according to the curriculum outcomes.

The characteristics of mathematical word problems are:

Step 3: Learners at this stage attempt to solve a problem by using

-They are a linguistically formulated cohesive and complex text,

Step 4: Learners will then check the correctness of their answers.

- They describe the quantitative qualities of an event and the connections between them;
- They require finding an unknown variable; and
- they involve assumptions and a question or an assignment.

Word problems play an important part in primary school mathematics. There is no effort to be spared in teaching them effectively. Learners are supposed to solve word problems in their earlier years of their primary school course. It is evident that the difficulty for learners in solving this aspect of word problem is due to their inability to read English as the language of teaching (Kalejaive, 1995) of word problem. The medium of instruction plays a role in poor performance of solving word problems. Kalejaive's study suggests that in order for primary learners to solve word problems successfully, the teacher must first help learners to read and understand the whole problem. This then means that to be successful in solving word problems, one requires comprehension and problem solving skills. Vernon (1969) argued that a learner who fails to understand the problem and does not acquire problem solving skills for solving word problems results in failure to find out the solution to the problem. Kalejaive (1993) also suggested the steps that can be used in guiding the learners to solve word problems properly and successfully.

The steps are as follows:

- Step 1: Let learners reread and understand the problem in order to grasp the meaning, to identify what is given and what is required.
- Step 2: Learners should form a mental picture of the problem so that they can use or apply the correct symbols, rules, laws, theorems and numbers and measuring units in relation to the correct mathematical method.
- Step 3: Learners at this stage attempt to solve a problem by using operations.
- Step 4: Learners will then check the correctness of their answers.

## 1. Identified the question/ problem

Except the steps suggested by Kalejaive (1993), different studies also suggest other strategies to be used in solving mathematical word problems.

Bonnie Boaz and Mary Kendall (2002) suggested six steps that can be used to solve word problems. These steps are:

Recent studies demonstrated the importance of solving word problems in the

1. Preview of the problem;
2. Read the problem;
3. Plan how to solve the problem;
4. Solve the problem;
5. Check your work; and
6. Review your work.

apply different strategies to real-world problems or word problems.

Bunch (1988) steps for solving word problem are:

Boaz and Tschier (1995) argued that solving word problems is a challenging

1. Read the problem.
2. Understand the problem.
3. Plan.
4. Solve.
5. Check.

Polya (1969) steps for solving word problems are:

importance in any classroom situation (see Heckhausen & Frey, 2002).

1. Understanding the problem;
2. Devising a plan;
3. Carrying out the plan; and
4. Looking back.

take others further than you have gone yourself. However, the

RUIFS Strategies are:

RU: Read the whole problem with understanding.

I: Identified the operation involved.

F: Formulate the statement.

S: Sequence the statements and solve.

Recent studies demonstrated the importance of solving word problems in the primary curriculum (Jooste, 2004 ; Spring, 2002 ; Verschaffel and De Corte, 1997). These studies suggested that word problems are important and they play a crucial role in learning and teaching mathematics in primary school. Therefore there must be no effort of avoiding to teach them at all. Spring (2002) showed that learners are supposed to solve word problems in early years of their primary school course for the purpose of developing learner's understanding of how to apply different strategies to real world problems or in their everyday experiences.

Fuys and Tischler (1995) argued that solving word problems in mathematics classrooms is regarded as a difficulty aspect for both learners and teachers. Learners tend to see word problems as one of "improved sentences" in mathematics classroom. Learners are therefore indifferent towards mathematics; they perform much better in numerical problems than in mathematical word problems.

Research has suggested that the main and most crucial factor for successful performance in any classroom situation is the teacher (Hohn & Frey, 2002), because what directly determines the instructions that take place behind the classroom door is the teacher rather than the external educational agenda or requirements. What does this mean to us as mathematics educators? It means that one cannot take others further than you have gone yourself. However, the study is mainly focused on learner's difficulties than teachers' difficulties and challenges.

Difficulties related to teachers are the aspect of teaching word problems in the mathematics classroom can be a study on its own right. The researcher's intention for the future study will be basically on teachers experiences or difficulties on this aspect of word problem. I believe that if learner's difficulties are identified and also teacher's difficulties are identified and recommendations are suggested, performance on solving word problems will be much better compared to what is happening in mathematics classroom situations in the aspect of solving word problems.

There is evidence that learners experience difficulties when solving word problems in both primary and secondary levels (Saljo & Wyndhamn, 2000). The analysis of these research result showed that learners in primary level experienced more difficulties than learners in the secondary level when solving word problems. They indicated that primary learners' performance in solving word problems is often surprisingly poor. There is ample research evidence in the literature that primary learners often solve word problems by focusing on the syntax of mathematics, rather than on the meanings of the events described (Mcneil, 1993, Greer 1993, Wyndhamn, 1993, Verschaffel et al.1994). In their interpretations of word problems, learners seem to follow rules and use symbols without reflecting on, or analyzing, what these rules and symbols imply in the specific context in which they are expected to solve word problems depends more on the level of psychological development of the learner.

Learner's performance on solving word problems is generally low compared to the performance of solving numerical problems. The study by Human Science Research Council (HSRC) (1985) on mathematics and science among South African primary and secondary schools showed that learners experienced more difficulties in mathematics than science. Difficulties in mathematics are more on solving word problems than solving numerical problems. Evidence to substantiate the status of poor performance in solving word problems among learners have been documented by different studies such as Brodie 2002, Adler et al.(2000);

Nkhata (1996); Sayers 1991 ; Howie (2003); Barwell (2004). They all reported that learner's difficulties in solving word problems were due to poor grasp or lack proficiency in the language of teaching and learning mathematics. The language of teaching and learning mathematics is a serious stumbling block which needs more attention than the mathematics itself. Research by Durkian and Shire (1991) indicated that learners tend to make errors and mistakes of mathematical interpretation or meaning based on the common everyday use of words for example the word "difference". In everyday language it means a distinction between two things. However in mathematical context it means to get the solution of subtraction problem. This is also evident for the researcher, when she asked the class of what is the difference between 7 and 3. One learner answered "The difference between 7 and 3 is: 7 is bigger than 3" or 3 is smaller than 7. Nixon, (2000) indicated that the performance on mathematical word problem is related to language proficiency. There is a high correlation between learner's performance on mathematical word problems in English and their proficiency in English. Furthermore, Howie's (2003:34) study revealed that learners lack proficiency of English was a strong predictor of their success in solving mathematical word problems. In addition, Barwell (2004:4) mentioned that reading skills and the meaning of words are the basis for the better acquisition of mathematical knowledge including mathematical word problems. This then suggests that the success of solving mathematical word problems depends more on the level of psychological development of the learner.

Important to note that mother tongue has a strong influence than second language in the teaching and Boaler (1993) indicated that the skill of solving mathematical word problems is in strong correlation with skills in mother tongue language. It means that mathematical word problems need to be analyzed from the view point of the mother tongue language. Many of us view English as a viable language of wider communication and therefore speaking it opens doors which were closed to vernacular speakers. Supporters of this view encourage the use of English as the

Again, Fuys and Tiaher argue that teachers and learners regard mathematical

language of learning and teaching in schools and maintained that vernacular education is a passport or bridge to another generation of poverty.

On the other hand, the other view maintains that there is a need to develop and promote African languages and one way of doing this is to encourage their use in schools. This means that vernacular languages should be given more prominence to ensure that they do not fade away. Most mathematics learners in South Africa learn Mathematics in English, a language which is not their main language. This view maintained that English is increasingly the language of internationals. Furthermore, learners who have difficulties with reading and computation are likely to encounter difficulties when solving word problems.

Nevertheless, the use of mother tongue in the learning and teaching situation as a medium of instruction has been considerably opposed by most of the parents who insist on their children being taught in English (Taylor and Vinjevold (1999). Mother tongue instruction forms one of the cornerstones of intrusive development of the child at school. In addition, Tsamir and Mandel (2000) mentioned the fact that mother tongue has the special role in the child's life. This then suggests that mother tongue finds a special place in didactics as it allows the child a wealth of educational experiences which may be expressed in his/her own language which and can be integrated smoothly into school based or pedagogy didactic learning situation. It is therefore important to note that mother tongue has a strong influence than second language in the teaching and learning of Mathematics. Lack of understanding the language used to present word problems results in handicapping efforts to the solving of the problem.

Fuys and Tischler (1979) shows that learners in the primary level do not have problem solving skills, their performance in solving mathematical word problems is very poor. They perform better in numerical problems than in word problems. Again Fuys and Tischler argue that teachers and learners regard mathematical

word problem as the most difficult aspect. May be this is one of the core reasons why learners perform poorly in word problems. Another argument around this evidence as the fact that in most text books word problems are presented at the end of chapter on a topic. This organization suggests that word problems is a difficult aspect which need understanding and skills for treating them.

Although the above cited studies also investigated the difficulties that learners Other teachers and learners take this organization in another way round. The fact that word problems are presented at the end, they argue that they are not so important in the teaching and learning of Mathematics. In this respect, teachers do not take word problems as importantly as numerical problems which are presented in the first section of the topic. This can be another reason why learners perform badly in word problems. There is evidence which shows that word problems produce constrains on learners due to the lack of understanding of the language being used Spannersburg and Southwood (1991) findings shows that where the medium of instruction and learners first language differ, there is likely to be much greater difficulties in developing mathematical understanding. The fact that learners are not first language speakers of English contribute to the difficulties they have in solving word problems. Other studies such as Barewell, (2004); Howie (2003); Forrest and Winberg (1993) also indicated that difficulties in solving word problems are related to lack of proficiency in the language of teaching and learning mathematics which is English.

These studies indicated that learning and teaching mathematics in neither a language that is the teacher's nor the learner's first language places complex demands on both teachers and learners. Fuys and Tischler (1979) showed that learners in the primary level do not have problem solving skills; thus their performance in solving mathematical word problems is poorer than their performance in solving numerical problems or any other type of problems in mathematics classroom situation. They perform better in numerical problems than in a word problems. Fuys and Tischler (1979) argued that teachers and

learners regard mathematical word problem as the most difficult aspect. Salyo and Wyndahanm (1997) showed that learner's difficulties in solving word problems involve poor reading and computation. Poor reading involves poor language. Language proficiency will then be discussed in the next section.

Although the above cited studies also investigated the difficulties that learners experience in solving word problems, more studies are still needed to find out what other problems learners experience when solving mathematical word problems. The findings will help us to improve the teaching and learning situation of word problems as mathematics teachers.

## **2.5 LANGUAGE IN MATHEMATICS CLASSROOM**

The importance of language for conceptualization and reasoning in general and for the teaching and learning Mathematics in particular, has been long acknowledged (Fuys & Tischler 1979; Pimm 1991; Vygotsky, 1962). When the teaching and learning of mathematics takes place, language plays a crucial role for meaningful learning, understanding of the concepts and thinking. Burton (1984) mentioned that thinking is the means used by humans to improve their understanding of, and exert some control, over their environment. Thinking mathematically demands more than ordinary thinking. For learners to develop active thinking, teachers should possess good problem solving skills. Certainly, good teachers are important models. They provide recourses and create environment that stimulate curiosity and provoke thinking. If the teaching is not geared to develop learner's thinking capacity then that particular teaching is said to be in vain.

Learning and teaching Mathematics has therefore features and elements that are similar to the teaching and learning of other languages. Leikin (2005) indicated that languages have a number of features that can be applied in the teaching

and learning situation and for the purpose of communication. Some of the features that he mentioned are:

- *Language is abstract:* it is a system of science and meaningful symbols that present meaning. For instance the words: different, product and symbols such  $\leq$ ,  $\infty$  and many others. These words and symbols have mathematical meanings. Language therefore gives access to knowledge and understanding.
- *Language is social:* it enables a person to interact with other people. When mathematics educator says four less than seven learners should know what this statement requires them to do. In mathematics context it means  $7 - 4 = 3$ .
- *Language rule-governed:* the rule determines the order of sounds in words and words in sentences. For example the rule for adding and subtraction of fractions state that we only add numerators if we do have the same denominators, for example.  $\frac{1}{7} + \frac{3}{7} = \frac{4}{7}$ . The rule goes further if the denominators are not the same we have to find out the common denominator, for example.  $\frac{2}{3} + \frac{1}{4}$  the common denominator of 4 & 3 is 12.
- *Language is communicative:* through language we transmit and receive messages. It means that communication between people takes place through language. By using language for communication the individuals internalize it for use as a tool for thinking. This use of language also takes place in Mathematics classrooms. Therefore, a mathematics teacher needs to know what learners are thinking through communication so that they can be able to access their understanding and help them overcome their misunderstanding. Many people argue that we do not need to learn Mathematics, because Mathematics need not to be done but through other kinds of mental imagery. These are reasonable arguments that need to be explored further by other researchers.

Just like teaching and learning other languages, in learning mathematics the learner has to learn new terminology and symbols and how to use them in conversations of mathematical contexts (Sfard, 2001). He refers to mathematical terminology and symbols as the mathematics register. A crucial part of learning mathematics particularly in word problems is learning how to use mathematics register accordingly and appropriately. Communicating mathematically, however, involves a great deal more than just an ordinary language. According to Wood (2005), it involves acting-interacting thinking-valuing-talking-writing-reading-in *the appropriate ways with the "appropriate props" at the "appropriate times"* using this description, we can therefore say that communicating mathematically involves, thinking, talking writing and reading in ways that are mathematically appropriate.

Mathematics educators are therefore expected to assist learners to develop ways of acting-interacting-valuing-talking-reading-writing-thinking mathematically, which will enable them to understand and be understood by the members of the wider community. Mathematics educators have to present learners with solving word problems using the mathematics register and also participating in mathematical conversations. The way in which language is used in mathematics is totally different from how language is used in other languages or other subjects.

Even though South Africa has eleven official languages, English is still used as a medium of instruction or the language of learning and teaching in many schools. Parents and some of the teachers say that English is the language of power and it is an international language. Vorster (2005) indicated that English is a viable language of wider communication. This view maintains that English is the language of international communication and commerce and therefore speaking

it opens doors which are closed to vernacular speakers (Booth and Thomas 2000).

In the former Department of Education and Training (DET) schools, learners were taught in their mother tongue from Grade 1 to Grade 4 and English and Afrikaans were taught as school subjects, in Grade 5 onward English was used as a medium of instruction. The constitution adopted for post apartheid South Africa in 1996 provides South African schools and learners certain human rights, amongst which are language rights. South African schools and learners can now choose their language of learning and teaching of their choice. For the first time, the nine African languages namely, Tshivenda, Xitsonga, Sepedi, Sesotho, Setswana, Isiswati, Isindebele, Isizulu and Isixhosa have been added to English and Afrikaans as the languages of teaching and learning. English and Afrikaans are the only two languages that enjoyed the benefits of official status in that apartheid era. Nevertheless the use of African languages as a medium of instruction has been considerably opposed by most of the parents who insist in their children being taught in English (Taylor & Vinjevold, 1999). Furthermore, many speakers of African languages have a bad image of African languages being used as languages of learning and teaching.

They associate teaching and learning in African languages with apartheid and inferior education (Adler & Setati, 2002). Most African schools opt for English as their language of learning and teaching. It is on the basis of this background why English is becoming more and more dominant because the majority of parents want their children taught in English. Arguments for having English as the language of instruction or the language of teaching and learning claim that it is the language of the market place, an international language for both education and economics and also the fact that learners use English textbooks and write examinations in English. In our history, language has been used as an

instrument of discrimination as the majority was and still is not proficient in English.

A generalization made by Brodie (1989) supports the view that learners whose language is the same as language of teaching and learning attain a high level of academic achievement. It is obvious that lack of proficiency in the language of instruction does bring about problems or difficulties in solving word problems as much time is spent translating into a more familiar language. It also leads to the misunderstanding of instruction, ideas and thoughts. The issue of the dominance of English in South Africa is not so easy to resolve. It will therefore take some years to resolve it. Most children's mathematical education takes place largely through language. The importance of language is not only for communicating and understanding. But it is also about learners linguistic abilities in mathematical thinking and in construction of mathematical meaning. Good performance in Mathematics is related to the proficiency in the language in which Mathematics is taught and to the proficiency of the language in which a learner is allowed and encouraged to think during construction of new knowledge. The richness of more than one language can complement each other in the learning and solving of mathematical word problems.

A primary challenge in the new language policy in South Africa is intended to address the over valuing of English and Afrikaans in relation to African languages. The debate around African languages in Education policy also made inroads into Mathematics curriculum and the debate still continues and more research still need to be done in the issue of which language of instruction can be used in Mathematics teaching and learning situation.

Language is the key for teaching and learning Mathematics meaningfully and effectively. It is not the key for Mathematics only but the key for any teaching and learning situation. This then suggests that without language, teaching and

learning would be highly impossible. Language makes the learner and the teacher understand each other. In Mathematics classrooms, it helps both teachers and learners to speak mathematically, which is one of the behavioral changes that should be desired in mathematics teaching and learning situations. Meaningful and effective mathematics learning may be closely linked to the language of instruction or the language of teaching and learning mathematics. However, as much as language may enhance concepts formation, this may depend on learners mastering or acquisition of the language. There is no doubt that a learner that has a higher acquisition or mastery in language of instruction performs better in solving mathematical word problems. This does not imply in solving word problems only but in all different range of problems and even in other subjects as well. Language therefore enhances teaching and learning and on the other hand, it quickly leads to the acquisition of mathematical knowledge with good understanding of the concepts.

Most mathematical lessons take place in a mixture of the language of teaching and learning mathematics which is English and mathematical language. Mathematics has been called a universal language, because it is a language of all the cultures and civilizations (Frincke & Meyer, 2005). The mathematical language constitutes a set of meanings that are appropriate to a particular function of that language, together with the words and structure which express these meanings (Orton, 1987). Lack of understanding of such words and structures in a language makes it difficult for a teacher to communicate Mathematics ideas with learners. Mathematical words may have different meanings from ordinary English, as learners try to make sense of the mathematical concepts as well as the unfamiliar language of learning and teaching, they might experience some serious difficulties or problems.

Mathematics and the language of teaching and learning cannot be treated in isolation; they are like body and soul and the two languages complement each

other. Language is one of the burning issues in mathematics curriculum. Setati (2002) indicated that language is not only an issue in mathematics classrooms but in all classrooms. Many people argue that language in Mathematics classrooms is not so important like it is in other classrooms because mathematics need not be done through words but through symbols, numbers and operations. These are reasonable arguments that the study will try to explore critically. For me, it is through language that mathematical knowledge, symbols, numbers and operations are transmitted from the teacher to the learner. In turn, learners have to know the language of teaching and learning in order to comprehend what they are being taught.

It is on this basis that Lemmer (2002) concluded that language is a crucial means of gaining access to knowledge and skills and thus determines good performance. Mathematical meanings and terms could not be understood without the language of teaching and learning natural language. This then suggests that both languages i.e. mathematical language and the language of teaching and learning mathematics go together. For this reason language has a powerful influence on the teaching and learning of mathematics particularly in the aspect of solving word problems as it creates mathematical knowledge and understanding. Similarly, Hart (1981) argued that understanding a language is the key to unlock the doors of successful achievement in mathematics.

Many of us learn language in order to be able to communicate to each other. Language therefore does not end as a tool for communication; rather it is also an essential tool for thinking. These two functions of language: communication and thinking cannot be treated separately, they are inextricably bound (Austin & Howson, 1979). On the basis of this statement I therefore argued that the use of language and mathematics is really banded together and the two cannot be treated in isolation as they complement to each other. By using language for communication the individual internalizes it for the use as a tool for thinking. The

use of language takes place in mathematics classrooms. Mathematics teachers need to know what learners are thinking so that they can assess their understanding and help them to overcome their misunderstanding.

The relationship between mathematics and the language of teaching and learning Mathematics are essential elements for good performance in Mathematics as learning subject. We use language to speak about mathematical concepts and ideas. Lange (2008) indicated that mathematics in its own right is a type of a formal language. Like any other language, Mathematics also has its own brand of technical terminology. In some cases a word in everyday usage has a different and specific meaning with Mathematics, for instance, words such as difference, root, group and many others. Their meanings in everyday language are totally different from mathematical language. In other cases specialist terms have been created which do not exist outside of mathematics for example tensor, fracial, functor and many others. Mathematical statements have their own complex taxonomy which is being divided into axioms, conjectures and theorems. And there are also phrases in mathematics which are used with specific meanings such as "if and only if", "therefore", and "implies to". Many words have different meanings in English and the Mathematics register (Orton & Frobisher 1996). The difference in the semantic structure of English and Mathematics language is another complicating factor.

Pimm (1981, 1991) and Adetula (1990) have shown that mathematical words may have different meanings from ordinary English and other languages. This then suggests that learners have to learn two languages simultaneously namely: English and Mathematics. As learners try to make sense of mathematical concepts as well as the learning of the language of teaching Mathematics which is not their first language, they might experience cognitive conflict.

Howie (2003) indicated that good performance in word problems is also related to the proficiency in the language in which Mathematics is taught and with the proficiency of learner's first language. Mathematical word problems need to be analyzed from the view point of the mother tongue. Again Howie (2002) and Sohngé (2002) argued that language proficiency is a crucial means of gaining access to important knowledge and skills and thus determines academic achievement. Vorster (2005) showed that learners in urban areas perform better in Mathematics as compared to their counterparts in rural areas. Because learners in urban areas are more advanced in English than learners in rural areas, that's why performance in solving word problems is good than performance of learners in rural areas.

Language therefore gives access for acquiring knowledge and good understanding. Learning Mathematics in a language which is not familiar to learners or teachers is more taxing and places additional elements on both teachers and learners. Teachers have a double task of teaching Mathematics as a subject and also to teach learners the language in which mathematics is taught at the same time. Hence learners struggle to learn Mathematics as a subject and to learn the language in which Mathematics is taught at the same time. It is therefore important to be aware that where the language of teaching and learning and the learner's language differ, there is likely to be much greater difficulty in developing mathematical understanding. I therefore argue that the role of language in the teaching and learning of Mathematics need to be considered seriously otherwise the value and the beauty of Mathematics will deteriorate from generation to generation. This means that the use of language for the communication of mathematical ideas is essential for the development of mathematical knowledge, understanding and thinking.

Language is one of the burning issues in Mathematics Curriculum. It is through language that mathematical knowledge is transmitted from the teacher to a

learner. In turn, learners have to know the language of instruction in order to comprehend what they are being taught. For this reason, language has powerful influence on the teaching and learning of Mathematics as it creates mathematical knowledge and understanding. Similarly, Hart (1981) argues that understanding the language is the key to unlock the doors for successful achievement in Mathematics, particularly on word problems. In other words, without language, teaching and learning would be impossible.

There are different ways in which the language of teaching and learning is handled in different schools. In other schools local vernaculars are used up to some point in teaching and learning processes and there is a change to the official languages at a certain point. In other schools the medium of instruction is used from the beginning of schooling (Nixon, 2000). With government intervention it is then decided that all schools use the medium of instruction from the beginning onwards. It is at this point where language of teaching takes another dimension. With respect to the school, policy documents have promoted, this implies that learner's first language can be used as the language of teaching and learning. Unfortunately parents and school do not want their children to be taught in their home languages. English as a medium of instruction is mostly used in many schools. They say that English is the language of power and it is an international language.

People argue that the issue of language in Mathematics is not important like in other subjects. People view Mathematics as manipulation of symbols and numbers. Evidently, for learners to know how to manipulate symbols and numbers there are some procedures and instructions which are written in a symbols and numbers they must be proficient in the language being used. Coquin-Viennot and Moreau (2003) mentions the fact that language is the key to open doors for successful achievement in mathematics. Language is both a tool

for communication and thinking. Brunner and Vygotsky (1962) also mention that language is a very powerful tool for the development of thought.

Communication and thinking are two functions of language. The two functions go together like body and soul. One is dependent on another for existence. Language then influence one's thinking. Failure to comprehend the language results in poor performance in Mathematics. Forrest and Winberg (1993) point to the link between poor language use and conceptual knowledge. They say that poor language use suppresses the numerical problems. For a learners to understand word problem, language skills are needed. The task in solving word problems is linked to the language of teaching and learning. Learners are quite often stretched simultaneously by the Mathematics they are learning and by the need to know the language of learning. The two cannot be treated in isolation as they band together and they complement each other.

Lack of proficiency in the medium of instruction does bring problems. Lange (2008) shows that learners in urban areas perform better in Mathematics as compared to their counterparts in rural areas. Similarly English is biased towards learners in urban areas. Furthermore, Howie found out that learners proficient in English is a strong predictor of their success in solving mathematics problems. Again in the Third International of Mathematics and Science (TIMMS) conducted in 1995 also show that the performance in Mathematics test indicates the measure of language proficiency in English. Studies regarding the impact of language achievement indicate the use of language of learning and teaching as a barrier in problem solving (Berry, 1995).

To be successful in solving word problems, one requires comprehension and skills. Vernon (1969) argued that if a learner does not acquire skills in language use it is inevitable that they will in reasoning as well as in attainment. Reasoning is fundamental to mathematical problem solving, particularly in word problems.

This means that the use of language is an essential tool for the development of mathematical thinking and understanding of language use in solving word problems. Learners must have a sense and meaning of the problem they are solving. There is a continuing debate in South African education and the public domain regarding which language should be used for teaching and learning Mathematics. This debate is due to the fact that learners are not yet fluent in English, which is the language of teaching and learning in their classrooms (Setati, Molefe & Lange, 2008).

- Delimitation of the Study,
- Ethical Consideration,
- Research Design,
- Population,
- Sampling,
- Pilot Study,
- Methods of Collecting Data, and
- Procedures Collecting Data

### 3.2 Delimitation of the Study

My initial plan was to give questionnaires to all Grade 6 learners of Tshianane Circuit. Because of time and financial constraints the scope of the study covered only ten schools within the Tshianane Circuit.

### 3.3 Ethical Consideration

In the context of education, ethics are particularly important (McMillan & Schumacher, 1993) in that they deal with theories about what is right or wrong

### 3.1 Introduction

This section explains how the study was conducted. It focuses on or highlights the methods and techniques that were used in order to realize the objectives or the purpose of the study stated in chapter one (1.3). It deals with the following issues.

- Delimitation of the Study,
- Ethical Consideration,
- Research Design,
- Population,
- Sampling,
- Pilot Study,
- Methods of Collecting Data, and
- Procedures Collecting Data.

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proper or improper, good or bad. In this study the researcher will consider the following ethical measures.

- Participants were informed that the test was not for marks purposes, but for research purposes and therefore, their names could be kept unknown. The researcher informed the participants to feel free to ask questions for clarity purposes. The researcher promised to provide feedback to participants on the findings or results of the study as soon as data analyzed had been completed.
- The researcher communicated the aim, objective, nature and future use of findings to participants.
- Voluntary participation.
- Confidentiality.

### 3.4 Research Design

As the study was intended to investigate or find out difficulties Grade 6 learners experienced when solving mathematical word problems, it was felt necessary to apply qualitative approach rather than a quantitative one. Quantitative approach was not found proper for the study because the mode, it allows the assessment conditions or the results in order to compare marks obtained by learners (McMillian & Schumacher, 2001). However, the study was not intended for comparison purposes but for investigating or discovery purposes.

Qualitative approach would help to present responses as put by the learners themselves in a descriptive form which then was followed by meanings and interpretations. In general, the main aim of the study was to allow for in-depth discovery of how learners solve word problems by means of showing or indicating all the steps for that particular problem. It was also in view of the fact

that seeing the steps shown or how learners arrived at their final answers of the problem could be attached with meanings and interpretations.

Individual learner's responses from the written test of solving mathematical word problems and learner's interview formed the main collection of data. However, qualitative approach was preferable as it allowed other methods of data collection which could be found necessary, for collecting more information based on the information found by the first method. According to Swanson and Holton (1997), qualitative approach gives the study deeper in-depth understanding of the difficulties found in more meaningful way. Once more, qualitative enquiry was deemed appropriate for the purpose of the study due to the following reasons which were mentioned according to Worthen and Sanders (1987):

- It is generally conducted in a natural setting. Learners write or answer the questionnaire in their respective classes.
- It utilizes the researcher as the chief instrument in both data gathering and analysis.
- It emphasizes depth description that is real, rich and valuable data.
- It employs multi-data-gathering methods or techniques.

### 3.5 Population

Bless & Higson-Smith (1995) defines population as a large set of elements that the researcher focuses upon and from which the results are obtained by testing the samples and also generalizing the findings. According to Dyer (1995) population is a large group of individuals from which a small number of individuals or sample is drawn. This large group of individuals shares a set of identifiable characteristics.

The population of the study was all the primary schools of Tshinane Circuit under the Vhembe District. There are many circuits in Vhembe District. However, because of time and financial constraints, the researcher covered only one circuit, which was Tshinane Circuit. The circuit comprised of 18 primary schools. The reasons why the researcher selected Tshinane Circuit were:

- Tshinane circuit is where the researcher is placed by the Department of Education. It was therefore, convenient and easily accessible for the researcher to conduct her studies at any time and it was easier to manage the respondents.

### 3.6 Sampling

Gay and Airasion (2003); Schumacher and McMillian (1993) defined sampling as the process of selecting a number of participants or a number of individuals selected from a population for a study, which represents a large group from which it was drawn. Ten schools were randomly sampled from 18 schools of Tshinane Circuit. Therefore random sampling was used in order to prevent unbiased and unfair samples as all the schools had an equal and independent chance to be selected. Because the study sought to investigate difficulties learners experienced when solving mathematical word problems, a questionnaire was administered to 20 learners with different abilities were purposively chosen by their Mathematics educators from each of the ten schools that were selected. Different abilities referred to the learners who were above average, average and below average.

The reasons for sampling specifically Grade 6 rather than Grade 5 or Grade 7 learners were:

- The researcher is a Mathematics teacher at Grade 6 level. She has taught Grade 6 learners for more than 15 years.

- Grade 6 learners represent a true reflection of the difficulties that they experience when solving word problems. By true/real reflection I mean that whether the difficulties are caused by learner's factor or teacher's factor or any other factor which can be revealed within learners themselves.

- The researcher assumes and believes that learners in Grade 6 have acquired enough mathematical knowledge that they can be able to use and apply in solving different types of mathematical problems. And also, an idea of what they understand and what they do not understand or identify the difficult aspects or topics in their teaching and learning of mathematics.

- Grade 6 level serve as both the end point of Intermediate Phase and also the starting point of Senior Phase, for the researcher's perceptions, learners in this level are in a transition level from one level to another level. Therefore, learners in this stage need more attention because their success and failure of their future achievements begin at this point.

### **3.7 Pilot Study**

Data collection was preceded by a pilot study, which was conducted at the school in which the researcher was teaching. This was to test validity and strength of the instrument as well as the relevance of the questions. Furthermore, it was to examine the questions for bias, sequence and clarity. The exercise would also help the researcher to determine the standard of the questions set compared to different learners abilities level. It would then give the

researcher an opportunity to remove ambiguities and inadequate wording from the questions in order to accommodate learners of different abilities.

### **3.8 Methods of Collecting Data**

The study used the following data collection methods to collect data:

#### **3.8.1 Written test on solving word problems**

A written test in a form of a questionnaire which involved solving mathematical word problems was administered to 20 learners from each school. Learners were expected to show all the steps which they applied or procedures they followed in order to get to the final answer.

##### **3.8.1.1 Background of the written test**

A written test was the main collecting data instrument for the study. It was mainly focused on investigating difficulties learners experienced when solving mathematical word problems through learners themselves. The rationale for using a written test was to form the basis and initial data from learners as the main source. The items of the test were selected from various Grade 6 textbooks. The context of word problems was changed into learners day to day experiences and the names also changed into the names of their home language (first language which is Tshivenda) otherwise the essence of the problem remained the same. Boaler (1993), Cooper (1993) and De Lange (1996) focused their studies on connecting Mathematics with learner's life experiences. They

see solving word problems as it makes sense and give meaning to the learners if the context of the problem is represented to learner's life experiences.

The questionnaire consisted of 25 items or questions of word problems covering addition, subtraction, multiplication and division more over all the five learning outcomes for mathematics were covered. The five learning outcomes are:

- LO1 Numbers, operations and relationships
- LO2 Patterns, functions and algebra
- LO3 Space and shape
- LO4 Measurement
- LO5 Data handling.

These are the five learning outcomes in which all the grades are expected to cover in each grade; however the content is different depending on the learner's level of understanding of that particular grade. And the key question in this regard is: Does this test allow the researcher to make appropriate interpretations and meanings of learner's difficulties in solving word problems? In order to answer this question the reliability and validity of the questionnaire were established by submitting the questionnaire to:

- The Department of Education in Mathematics section.
- Two experts in the field of Mathematics Education.
- Grade 6 Mathematics Educator who is knowledgeable and experienced in Mathematics.

### 3.8.2 Unstructured interviews

The reason why unstructured interviews and were adopted was due to the fact the researcher found that learners of the ten schools which wrote the test did not perform well in the test; and the worst part was that they did not indicate

the steps or procedures of how they arrived at the final answer. On this basis it was difficult for the researcher to see and find out where the problem lied. Therefore, the researcher wanted to find out what kind of difficulties rather than just seeing that there was a problem for the purpose of suggesting proper recommendations for the benefit of effective teaching and learning word problems meaningfully.

The researcher believes that learners express themselves in more understandable ways through conversation than in writing, as they were also allowed to express themselves in their own language, which in this case was Tshivenda. Setati (2002) regards teaching in more than one language as one of the important resources for effective teaching and learning especially when the language of teaching and learning is not the learner's first language.

Interviews also allowed for the possibility of probing interviewees as well as expressing their feelings, misunderstandings and misconception which they had in the aspects of learning and solving word problems.

### **3.8.2.1 Background of the interview**

As the written test did not answer the research questions and set objectives of the study unstructured interview was opted for. The unstructured interview was used due to time constraints and the long process of getting permission from the Department of Education which took a couple of months. Furthermore, 2.1 in Appendix B which states that permission is granted on condition that the research is done outside contact time to avoid lesson disruptions was taken into consideration. It would be therefore difficult for the researcher to find the participants in convenient time; moreover the researcher was not a full time student.

The questions raised by the interview largely revolved around learner's experiences in word problems in their teaching and learning of Mathematics .

### 3.9 Procedures for data collection

Before the data collection exercise began, I asked for permission to conduct research from the Vhembe District to visit the schools in Tshinane Circuit. This was done through writing a consent letter to them. After the researcher was granted the permission from Vhembe District which allows her to conduct her research at Tshinane Circuit. The researcher then made a prior visit to 10 selected schools with the approval letter from the Vhembe District.

During this visit, informal and formal discussion were held with the principals, Heads of department, school management team and Grade 6 educators to make arrangements for the written test that Grade 6 learners should write. The researcher produced the approval letter to them which came from the Department of Education and it was accepted and considered positively.

The researcher also showed that learners should not be limited in time factors with the reason that the marks are not promotion purposes but for research purpose. After learners had completed to write the test, answer sheets together with the questionnaires should be collected by the invigilators and kept safe. In the researchers will then come and collected them and mark them personally.

#### 3.9.1 Procedure for writing a test

The subjects were instructed to show all their calculations when solving word problems. Specifically, they were told to read the problem more than once until they understood and then solve it. In order to give learners assurance that the

test was not for the purpose of promotion or for marks, they were allowed to ask questions for clarity purposes.

Twenty learners who were purposively selected wrote the test in one class. Learners were then told that the test was not for marks purposes but for research purposes. In addition to that they were told to feel free to ask questions for clarity purposes and they had to show or indicate all the steps that they applied to find out the final answer in the answer sheet provided. The researcher moved around the class to see if all learners were writing. Only to find out learners were really struggling to answer the problems presented to them. And this was indicated by the following reactions towards solving problems in the questionnaire:

- Taking longer time in reading without writing.
- Looking around the classroom as if the answers were written somewhere and even scratching their heads.
- Most of the questions were not answered.
- Asking unnecessary questions, for instance how do we do it, I do not understand the whole question

As the researcher seeing that the time for writing was more than the time expected although there was no time limit; she requested the learners to submit their answer sheets if they were finished or if they wished so. All the learners submitted their answer sheets at once.

### 3.9.2 Procedure for interview

Unstructured interviews were administered to some of the learners in a group rather than individually. Follow up questions were asked to probe and get in-depth meanings of poor performance in solving word problems. The difficulties

that directly contributed to low performance were asked. The other question asked was; the experiences of learning and solving word problems in their learning and teaching situation. However; there was a general complaint from all the learners who were interviewed. Some of the teachers were also interviewed indirectly. Teachers question was whether they taught solving word problems in Mathematics classroom?

The objectives of the study in Chapter 1. The quantitative data followed by learner's low correct responses compared to learner's high incorrect responses whereas qualitative data followed by learner's statements with its description and interpretations. Data analysis began during data collection period by the reactions which learners had shown while answering the questions. Data collected were analysed focusing on the results of the written test. Furthermore, learner's and teacher's responses from interviews were also critically analysed. However, the main collection method of data was a written test for the study. Therefore the debate or discussion in the study of data analysis was basically based on learners and teacher's responses from the interview then on the results of the test on solving mathematical word problems amongst Grade 6 learners.

The reactions that learners showed towards solving word problems and the results of the test revealed that learners experienced serious difficulties when solving mathematical word problems. This was evident as learner's performance in the written test was very poor. The main purpose of the study was to investigate or find out difficulties learners experienced when solving mathematical word problems. Thereafter, the data was arranged and organised into tables and followed by descriptions and interpretations from learners and teachers' statements or responses in the interview.

Warthen and Sanders (1987) mentioned that the purpose of data analysis is to reduce and synthesise information collected in order to make sense out of it and also to allow inferences about populations, while the purpose of interpretations is

## CHAPTER 4: DATA ANALYSIS



### 4.1 INTRODUCTION

Analysis of data was both quantitative and qualitative. The qualitative data complemented the quantitative data which addressed the research questions and set objectives of the study in Chapter 1. The quantitative data followed by learner's low correct responses compared to learner's high incorrect responses whereas qualitative data followed by learner's statements with its description and interpretations. Data analysis began during data collection period by the reactions which learners had shown while answering the questions. Data collected were analysed focusing on the results of the written test. Furthermore, learner's and teacher's responses from interviews were also critically analysed. However, the main collection method of data was a written test for the study. Therefore the debate or discussion in the study of data analysis was basically based on learners and teacher's responses from the interview than on the results of the test on solving mathematical word problems amongst Grade 6 learners.

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Worthen and Sanders (1987) mentioned that the purpose of data analysis is to reduce and synthesise information collected in order to make sense out of it and also to allow inferences about populations, while the purpose of interpretations is

to combine the results of data analysis with value statements criteria and standards, in order to make judgements, conclusions and recommendations about the investigated problems. This constitutes the actual report of the study. It shows the presentation and analysis of evidence found.

## 4.2 QUANTITATIVE ANALYSIS

Quantitative analysis was shown by means of tables which showed learners' both correct and incorrect responses as in Table 1 below. Furthermore Table 1 was complemented by Table 2 which shows the summary scores of learners depending on the same percentage which they obtained in the written test.

### 4.2.1 Analysis of the written test for all learners

A total number of 200 learners from 10 schools wrote a written test on solving mathematical word problems. The data in Table 1 below shows the percentage of correct and incorrect responses in the written test. The correct responses were very low compared to high incorrect responses. All learners performed badly or failed the test in the aspect of solving mathematical word problems in among Grade 6 learner. This is evident as Table 1 shows below, in terms of learners, low correct responses compared to high incorrect responses, it was then noted that learners experienced difficulties when solving word problems. The fact that learners experienced difficulties was not firstly shown by the low correct responses which learners obtained; however, the researcher had already noted during data collection in Chapter 3. Learners correct responses were surprisingly lower than expected by the researcher.

TABLE 2: LEARNERS RESULTS OF THE TEN SCHOOLS IN PERCENTAGE (%)

NO	A		B		C		D		E		F		G		H		I		J	
	CORR	INCO	CORR	INCO	CORR.	INCO	COR	INCO	COR	INCO	COR	INCO	COR	INCO	COR	INCO	COR	INCO	COR	INCO
.L	R	RR.R	.R	R.R	R	R.R	R.R	R.R	R.R	R.R	R.R	R.R	R	R.R	R.R	R.R	R.R	R.R	R.R	R.R
1	0	100	12	88	0	100	4	96	4	96	0	100	8	92	4	96	12	88	8	92
2	4	96	12	88	4	96	8	92	8	92	0	100	4	96	8	92	8	92	8	92
3	4	96	0	100	20	80	16	88	4	96	8	92	0	100	8	92	8	92	4	96
4	0	100	8	92	4	96	12	88	4	96	8	92	0	100	16	84	8	92	0	100
5	8	92	4	96	0	100	0	100	0	100	0	100	8	92	16	84	4	96	8	92
6	2	98	8	92	12	88	8	92	4	96	20	80	0	100	4	96	4	96	12	88
7	4	96	0	100	0	100	4	96	20	80	8	92	0	100	8	92	8	92	16	84
8	0	100	0	100	4	96	0	100	8	92	4	96	0	100	0	100	8	92	8	92
9	0	100	8	92	8	92	8	92	8	92	8	92	0	100	4	96	0	100	16	84
10	0	100	12	88	4	96	8	92	12	88	8	92	8	92	8	92	8	92	16	84
11	12	88	4	96	4	96	8	92	0	100	8	92	4	96	88	12	4	96	20	80
12	4	96	12	88	4	96	20	80	8	92	8	92	0	100	0	100	4	96	20	80
13	0	100	4	96	8	92	0	100	4	96	12	88	8	92	4	96	0	100	32	68
14	6	94	4	96	8	92	8	92	0	100	8	92	8	92	8	92	0	100	4	96
15	0	100	0	100	12	88	12	88	16	74	0	100	4	96	16	84	8	92	20	80
16	8	92	4	96	16	84	8	92	8	92	0	100	4	96	4	96	4	96	4	96
17	0	100	8	92	0	100	8	92	8	92	8	92	0	100	0	100	8	92	8	92
18	8	92	8	92	8	92	0	100	4	96	4	96	0	100	0	100	0	100	4	96
19	4	96	28	72	0	100	12	88	4	96	8	92	8	92	8	92	0	100	8	92
20	0	100	0	100	8	92	12	88	4	96	12	88	4	96	0	100	4	96	0	100

CORR.R → CORRECT RESPONSES  
 INCOR R.R → INCORRECT RESPONSES  
 A-J → SCHOOL 1-10  
 L → LEARNER

In order to give a clear picture of Table 1 above that indeed learners performed badly, a summary of learners who obtained the same marks from the lowest to the highest is shown in Table 2 below. Therefore, Table 2 is a summary of scores of all the learners in 10 schools that participated in the study. Out of 200 learners who wrote the test, none of the learners reached the minimum of 40%. This is evident as Table 2 shows. Therefore, the following table shows the summary of how many learners obtained the same marks from 0%, 2%, 4%, up to the highest mark which was 32%. It indicates the information drawn from Table 1.

Marks obtained	Number of learners	Total number of learners
0%	48	200
2%	1	200
4%	43	200
6%	1	200
8%	67	200
10%	0	200
12%	18	200
14%	0	200
16%	9	200
18%	0	200
20%	9	200
22%	0	200
24%	0	200
26%	0	200
28%	1	200
30%	0	200
32%	1	200

*Table 2: Number of learners obtained the same marks*

It is clear from Table 2 above that not even one learner reached the minimum mark of 40% from all 10 schools. The highest mark was 32% which was obtained by one (1) learner followed by 28% which again was obtained by 1

learner.

Generally, learners did not perform well at all in the test of solving word problems. This is evident in Table 1 above where most of the % incorrect learner's responses are greater than its corresponding % correct learner's responses in 10 schools that participated in the study. This shows that learners experienced difficulties when solving word problems among Grade 6 learners. The difficulties were identified by a high percentage of learners' incorrect responses compared to low learners' correct responses. A high percentage of incorrect responses indicated that there were difficulties among learners in the aspect of solving word problems.

However, the researcher did not find out exactly what kind of difficulties the learners had from the high percentages of incorrect answers even from the observation during data collection. Moreover, learners did not show how they got their answers nor did they show the required steps for arriving at the final answer when answering the questions, they just wrote the answer only, which was not right in most of the questions. My experience as a Mathematics teacher revealed that the beauty and value of Mathematics lied on the questions of 'how' rather than on the question of 'what'. This then means that the importance of solving any type of problem in Mathematics situations was more based on how the answer was found rather than on what the answer to the problem was.

#### 4.3 QUALITATIVE DATA ANALYSIS

For me the 'how' question is more crucial than writing the correct answer. In my teaching and learning situation I always emphasised the steps as more worthy and valuable than the final answer, whether it is right or wrong. The weight of the problem is basically on how learners got the answer rather than the answer itself. For instance, problem 1 in the questionnaire in this study (Appendix C). Learners answered the problem differently as follows: For example:  $54 + 48 = 102$  others wrote only the answer as 102. Others answers were:  $54 + 48 = 92$

and some wrote as  $54+48=912$ . The first group got full marks, the second got only 1 mark for the answer only and the third group got 4 marks.

Looking at the example given above it is clear that how to get the answer is more important than to write an answer only. In the second group, the problem can be seen clearly that learners have a problem of carrying or adding numbers with more than 1 digit. Learners in this study answered the problem as group 2 above and it was difficult for a researcher to find out what exact difficulties learners experienced in the aspect of solving mathematical word problem. It is on this background where the researcher found it necessary to administer unstructured interviews for both learners and teachers in order to investigate the difficulties that learners experienced.

However, difficulties cannot be shown by observation and marks obtained from the test only; rather it can be clearly investigated from learners and teachers themselves through words or statements and quotations followed by interpretations. Or either from learner's writing responses if they had solved problems showing all the steps of how they arrived at the final answer. Because learners did not show the steps in this study, unstructured interview was considered immediately as it was not planned. The reasons for why particularly unstructured and not structured interview was already stated in Chapter 3 above.

### 4.3 QUALITATIVE DATA ANALYSIS

#### 4.3.2 Analysis of interview responses

As the quantitative data analysis did not answer the research questions and set of objectives posed by the study; qualitative data analysis was then used in order to identify which difficulties do learners had in solving word problems. The tables above (1 & 2) did not show exactly what kind or type (s) of difficulties learners had; rather they showed that there was considerable evidence for learner's difficulties in the aspect of solving word problem than any aspects in

mathematics. Therefore interviews were found crucial and necessary for this investigation. Dowling (1998) argued that interviews enable the researcher to explore difficulties in more detailed manner. As the interview was used, the analysis from learners responses were in a form of statements followed by interpretations which would then address the research questions and the set objectives posed by the study in Chapter 1 (1.4 and 1.7).

#### **4.3.1 Background of the interview**

The interview was administered to some of the learners in the form of a group rather than individually. Basically, the aim was to find out and gain an insight of learners' difficulties when solving word problems. The interview consisted of 2 main questions that were then followed by probing questions depending on learners' response (s) to the main questions. The questions were:

1. Could you explain why you performed so badly in the test?
2. Did you ever come across with this type of problem in your teaching and learning situation?

The interview was not tape recorded and verbal responses were used to analyse data. What follows in the discussion below were responses of the interview in terms of each two main questions from learners themselves.

#### **4.3.2 Analysis of interview responses**

##### **QUESTION 1: Could you explain why you performed so badly in the test?**

Learner's responses for this question showed that the questionnaire was too difficult, confusing and tricky for them. They referred to difficulty in the sense

that learners did not grasp the meaning of the problem or question that it holds; which then resulted in failure to solve the problem. Learners indicated that the English used was too high for them to understand and that if the English used were simple and straight forward it would be easy for them to grasp meaning of the problem. Therefore they would be able to solve the problem correctly. On the other hand it was confusing or tricky because words used in the test also confused them as they knew what they meant in everyday usage. But when they were used in these mathematical word problems, they were unable to grasp what exactly they meant. Examples of words that learners mentioned were: decrease, less, percentage, difference. They further stated that when words such as difference, sum and product were used in the same problem as question 14 in the questionnaire (Appendix B) is more frustrating and confusing. Some of the statements that showed that learners found it difficult to grasp the meaning of the problem were:

'English used was too high for me. For instance question 3, 4,5,11 and others'.

'I found difficult to read almost all the questions'.

'I am not good in English even my English teacher always confirms that is worried about me'.

'I am familiar with the words used but I did not get the right answer'

'I found it hard for me to understand the meaning of some words although I knows their meaning for instance less, decrease, product and difference'.

The majority of learners showed that English as the language in which Mathematics was taught and learnt made them feel uncomfortable. They even failed to express themselves clearly and could not participate fully in class. They

were also unable to ask questions from the teacher. They were in situation they were forced to memorise facts, rules and procedures without understanding them.

#### 4.3.2.1 Difficulties found

##### 4.3.2.1.1. In question 1.

### **1. Lack of proficiency in the language of teaching and learning Mathematics:**

Many learners in these ten schools said that English language as the language of instruction, particularly in mathematics classroom confused and frustrated them. They failed to express themselves in English in most of the cases. According to the researcher's point of view, it is important for learners to understand the language of teaching and learning before they learn Mathematics as a field of learning area with its own specific knowledge. If learners become proficient in the language of learning and teaching, the demand of learning Mathematics as a content with its own language knowledge which is different from every day English usage will be less and convenient for the learners. Learners would not actually memorise rules, producers, facts, formulas that they have learnt in the learning and teaching of mathematics particularly in solving word problems without an understanding.

The researcher is not referring to English as the only language of learning and teaching that learners should be proficient with, rather she is referring to any language that should be regarded as the language of learning and teaching. The constitution adopted for post-apartheid South Africa in 1996 provides for certain human rights amongst which are language rights.

For the first time nine African languages i.e. Tshivenda, Xistonga, isiNdebele, isiXhosa, Sepedi, isiZulu, Sesotho and Setswana have been added to English and Afrikaans which were the only two languages that enjoyed official benefits in the apartheid era. This means that multilingualism is now encouraged through the new constitution. Therefore, South African schools and learners can now choose their language of teaching and learning which learners can be more comfortable with. Unfortunately, many speakers of African language have a bad image of African language being used as languages of teaching and learning as they associate teaching and learning in an African language with apartheid and inferior education (Adler et al., 2002:117).

Parents' memories of Bantu education combined with their perception of English as a passport to better education are making the majority of black parents favour English as the LoLT (NEPI, 1992:13). Despite having a bad image and associated with apartheid education, African languages do not have their own mathematical terminology which is suitable for nine African languages. This then suggest that their underdeveloped vocabulary of mathematics concepts and terms is borrowed from English. Therefore the issue of teaching and learning Mathematics is not an easy task. In other words, the issue of teaching and learning in other languages in South Africa is not easy to resolve and it has its own challenges and complex ways into classroom situations particularly in Mathematics classroom. At Tshinane circuit, learners were taught Mathematics in English, which is not their first or main language.

The study found out that learning and teaching Mathematics in a language which learners do not speak in everyday situations and in which they are not even proficient, places more demands on learners. More demands in the sense that learners are learning Mathematics with the language which they are still learning. It presupposes that the learner has more to do than just learning Mathematics, particularly in mathematical word problems. For instance; learning the language

of instruction, mathematical language and mathematics as a body of knowledge and different problem solving skills to deal with that particular aspect or a problem. It is on this background why learners performed so badly in the written test. This is evident as learners were not proficient in the language of instruction, mathematical language and knowledge and also problem solving skills. There were problems that required learners understanding of the language of instruction which did not involve mathematical terms which were also poorly done and some of the learners did not attempt to solve them at all. This then means that learners failed to make sense out of the question. Language of instruction is the key to teaching and learning Mathematics meaningfully. It helps both teachers and learners to speak and communicate mathematically. Meaningful mathematics particularly in the aspect of solving word problems is closely linked to the language of teaching and learning.

## **2. Lack understanding of mathematical language**

Learners had problems of interpreting words used in everyday English usage into mathematical meaning. The concept "mathematics" as a language recognises that mathematics is a form of a language (Addler and Setati 2002:86). The claim does not suggest that mathematics can be equated to language like Sotho, Tswana, Tshivenda or any other language that one may think of. According to Pimm (1991; 207), mathematics is not a natural language in the sense that English and Japanese are. It is therefore not a "dialect" of English, or any other language, either learning mathematics therefore involves learning to speak, read, write and act like mathematicians, and which involves the use of mathematical symbols, operations, notations, terminology and expressions. This suggests that learning and teaching mathematics therefore has specific language demands that may not necessarily be shared with any other subject or that can mean the same thing in every day usage of language or in different subjects. Hence,

mathematics is not exactly a pure language that we can use for the purpose of communication; but it has characteristics of a language and learning and teaching; it has elements that are very similar to learn any pure language.

Research by Durkin and Shire (1991) showed that learners tend to make errors of interpretation based on the common everyday use of a word. Most of us seem to think or believe that learners who are fluent in English are good in Mathematics which is not always the case in all learners. What this means is that terminology used in Mathematics and English terminology take on different meanings due to different contexts. Mathematics terminology will be new for all learners who are fluent in English and to those who are not fluent. Of course, these difficulties may be different particularly in cases where learners are fluent in English.

Just like teaching and learning other languages, in learning Mathematics, learners have to learn new terminology and symbols and have to use and apply them in conversations of mathematics contexts. The researcher argues that a crucial part of learning Mathematics, particularly in the aspect of word problems, is to learn how to read, speak, write, communicate, think, and reason mathematically and even how to use and apply mathematical problem-solving skills correctly. This then suggests that the learner has more to do than just mere solving a problem. Literature on mathematics education also revealed that learners usually encounter problems when learning maths in English which is the second language as indicated by this study.

### **3. Lack of problem solving skills**

Learners did not have problem solving skills. There were questions which required learners to use problem solving skills to answer the question for example, Question 4 in Appendix B. Learners are very familiar with money and

changes. If the question was Vhuyo has R30 and he used R5 to buy sweets and R10 to buy one packet of chips learners would have the right answer with the right steps to get the final answer. However in this case it requires learners to use proper problem solving skills such as what is  $\frac{1}{6}$  and  $\frac{1}{3}$  of R30. Because  $\frac{1}{6}$  was not written in money form, learners were unable to find the answer. In this regard learners showed that they were lacking good problem solving skills. The findings of the study suggests that, problem solving in the teaching and learning of Mathematics particularly in the aspect of word problems needs understanding the problem and the meaning of mathematical word which followed by problem solving skills as the key for successful or good performance in Mathematics in general. The main issue in solving mathematical word problem is that of 'know how'. Knowledge that the learner possesses about the subject matter, based mostly on knowing how than knowing *what*. Therefore knowing *how* results in a correct answer. However knowing *how* involves problem solving skills rather than facts and rules.

**QUESTION 2:** Did you ever come across with this type of problem in your teaching and learning situation?

Learners indicated that they had never ever come across that type of problem written in the form of words or statements in their teaching and learning of Mathematics. Some of the statements expressing such views were:

*'Our teachers like teaching us problems written in numbers and symbols only'*

*'It is for the first time seeing mathematical problem written in a form of sentences or statements like in this question paper that you gave us to write it.'*

*'When I looked the question paper the way it was written I knew that I would not make it all.'*

*'I came across with these types of questions in the text book that we use in the classroom and my teacher said that we have to ignore them because they are too difficult in our level of understanding'.*

The responses from different teachers were:

*'My teacher likes teaching and solving simple problems which involves numbers and leaves out problems written in words or statements'.*

*Teacher 1: I would be very willing to try and teach them*

*'My teacher says that we should not bother ourselves much with problems written in words but focus only in numerical problems.'*

*Teacher 2: I would be very willing to try and teach them*

Resulting from the above mentioned statements given by learners, there was a general complaint of teachers not teaching solving word problems in their teaching and learning situation. Learners showed that if they were taught this aspect of word problems in their classroom situation, the performance would be much better than what they got. The researcher felt that there was a need of teaching and learning the aspect of word problems in Mathematics and in every topic, otherwise failure to do that, mathematics will lose its language, meaning and value. For me, the sense of mathematics is based on the knowing and understanding the meaning of numbers, symbols and mathematical words. Mathematics is a subject that needs its own world different from other subjects and also to every day experiences. In mathematics classrooms, learners and teachers are expected to speak, think, reason and write mathematically for the purpose of giving mathematical language its value and meaning.

From the responses given by learners in question 2. The main complaint was basically based on teachers than learners themselves, the researcher found it worthy to find out or verify from the teachers themselves as there was a general complaint among learners that teachers were not teaching word problems in mathematics teaching and learning situations.

The main question to teachers was: Do you regard or teach mathematical word problems in your teaching situation?

The responses from different teachers were:

**Teacher 1:** *How can I teach learners this part (word problems) of mathematics which is regarded to be so difficult by many teachers who are very good in mathematics than me who were just given this subject?*

**Teacher 2:** *I would be very unfair to myself and the learners to teach them word problems because even I as a teacher, word problems is too difficult for me. Hence, I cannot put difficult on top of the other difficulties that learners were experiencing when solving easy aspects in mathematic classroom such as numerical problems, geometrical problems and others. "Ndi nga si phaphe mbulu nthu ha inwe" ( means that I cannot add difficulties on top of the other difficulties).*

**TEACHER 3:** *I do not regard word problems as part and parcel of my teaching activities in many reasons. Examples of reason given were:*

- *To difficult for the learners to understand them.*
- *Time consuming as it needs more explanation and practice.*
- *Mathematics is about dealing with numbers and symbols most of the time.'*

**TEACHER: 4** *Learners from my class showed that they did not like mathematics because it requires them to think and reason, and they performed poorly in numerical problems. What more on word problems? Therefore I can not waste time and energy by exposing them in solving word problems'.*

### 4.3.2.1 Difficulties Found

#### 4.3.2.1.2. In Question 2

##### 1 Word problems are difficult in their own right.

The idea that word problems are difficult in their own nature was proved by all the learners who participated in the study. Because of their difficulty, both teachers and learners developed negative attitudes and lack of interest when learning, teaching and solving word problems in their classroom situations. According to the researcher's point of view, difficulty in any situations, for instance, in everyday situation and in the teaching and learning situation cannot be avoided or ignored at all. It is a crucial part of our lives in general. Life and teaching and learning without difficulties are artificial. The important thing when difficulties emerged in your way is not to take another way or just ignore or avoid it, rather it is to find a better and proper way /strategies/ methods and right people of dealing with these difficulties. Ignoring and avoiding them will affect your life in one way or another. Teachers should know which ways, methods, strategies that they can use in Mathematics classroom situation for the goodness of themselves and their learners for teaching word problems effectively and efficiently. All learners expressed their desire to learn from their teachers and therefore teachers should see to it that they teach word problems in a meaningful way that will make sense to the learners.

From the given teachers responses above, it was noted that learners were not exposed to the aspect of solving word problems at all. According to the researcher, teaching is an activity in which learners learn from their teachers as teachers are the once who have knowledge about the aspect. Teacher's efforts of teaching and not teaching are measured by learner's performance in that particular aspect. Although the researcher believes that performance is a two-

way process, the two ways should have the same degree of efforts but used differently. If the degree of effort is not the same, it then results in poor performance. This then means that failure to teach a particular topic or aspect in the way it should be taught results in poor learners performance.

On the other hand, if teachers are teaching properly and learners are not willing or eager to learn and study more, it also results in poor performance from learners. Performance therefore requires the two to do their tasks honestly and properly. If this can happen in the teaching and learning situation there is no doubt at all that the performance will be good and excellent. For me good performance does not mean all the learners are expected to get 100% but one can see that the two are on their right track. Looking at the 2 tables above it is clear that teachers were not teaching word problems in their teaching and learning classrooms.

If learners were taught word problems, there would be some learners who reached and even exceeded the minimum mark of 40%. Even if they were only 10 or 20 learners, one can say that some of the teachers were teaching this aspect of word problems. I therefore argue that all learners have a potential to learn from their teachers; if they are willing to learn, teachers are therefore not only teachers but also motivational speakers for the purpose of encouraging and motivating their learners to learn effectively. Failure to teach and motivate learners means learners' failure to perform and achieve well. I therefore suggest that there should be a strong emphasis regarding the aspect of teaching, learning and solving of word problems in mathematics classroom situations and in every topic as a difficult aspect.

The researcher indicates that because word problems are difficult in their nature, teachers and learners tend to develop negative attitudes which lead to loss of interest towards teaching and solving word problems in the teaching and

learning of mathematics. The findings of the study showed that teachers instill the negative attitude to learners by not teaching them. Good teaching of solving word problem and learner's proficiency in the language of instruction in this study would have provided a good chance of learners to solve word problems successfully. This concurs with the findings of Orton and Wain (1994), which showed that the difficulty of a word problem is related to both its mathematical content and its semantic structure. Hence, word problems require more careful reading with an understanding than just to read for the sake of reading. In addition,, learners should be sure that they identified what is given and what has to be found and understand the meaning of each word . Both two languages that are language of instruction which is English and mathematical language in its own right therefore, contribute to the low performance of solving word problems for this study.

The study showed that a teacher plays a major role in learner's poor performance in this study. Otherwise if teachers did not play a role, the performance would not be the way it is shown in Tables 1 and 2 in Chapter 4. The study regards a teacher as the integral and significant part of learners poor performance in solving mathematical word problems, otherwise learners would perform much better than what they have performed in the written test.

The researcher believes that in order to understand learner's difficulties for the purpose of improvement of learner's performance we should look first at the teacher's mathematical knowledge, experiences and efforts on his or her teaching situation. Teacher's knowledge and experiences play a major role in the teaching and learning situation. Teachers are therefore expected to teach learners Mathematics effectively and efficiently, in order to help learners to develop into competent and productive members of the mathematical world of the modern society which requires mathematical knowledge. The teacher therefore plays an important role for good and proper acquisition of a learner's mathematical knowledge. It means that the teacher is the only ultimate person in mathematics situation responsible for learner's proper required mathematical

## CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

### 5.1 INTRODUCTION

The major objective of this study was to find out difficulties that learners had when solving mathematical word problems among Grade 6 learners. The study has shown that learners experienced difficulties when solving word problems in Mathematics. The difficulties were found as they were already mentioned in Chapter 4 above. The difficulties were: poor lack of proficiency in English as the language of teaching and learning Mathematics, lack of understanding of mathematical language and difficulty of word problems in its own nature.

### 5.2 RECOMMENDATIONS

These findings showed that a teacher plays a major role in learner's poor performance in this study. Otherwise if teachers did not play a role, the performance would not be the way it is shown in Tables 1 and 2 in Chapter 4. The study regards a teacher as the integral and significant part of learners poor performance in solving mathematical word problems, otherwise learners would perform much better than what they have performed in the written test.

#### 5.2.1 Monitoring and Intervention

The researcher believes that in order to understand learner's difficulties for the purpose of improvement of learner's performance we should look first at the teacher's mathematical knowledge, experiences and efforts on his or her teaching situation. Teacher's knowledge and experiences play a major role in the teaching and learning situation. Teachers are therefore expected to teach learners Mathematics effectively and efficiently, in order to help learners to develop into competent and productive members of the mathematical world of the modern society which requires mathematical knowledge. The teacher therefore plays an important role for good and proper acquisition of a learner's mathematical knowledge. It means that the teacher is the only ultimate person in mathematics situation responsible for learner's proper required mathematical

knowledge. This is the crucial part of the teacher in the learning and teaching situation. The role of the teacher demands more on both content and the learner. On content side, I prefer that he or she should be knowledgeable about the subject matter and on learners side, I mean focusing on learner's knowledge, background and how what teachers teach make sense to them. If learners make sense of what teachers are teaching, we can say that learning is taking place effectively. Other research has been done in Mathematics, which investigated difficulties learners experience when solving word problems. However, the same learners' difficulties are still experienced even today. What does this mean to us a "researchers"?

## 5.2 RECOMMENDATIONS

In view of the above mentioned difficulties drawn from the study, which were based on the understanding that teaching and learning of mathematical word problems should be promoted and encouraged by all mathematics teachers in all grades it should be recommended that:

### 5.2.1 Monitoring and intervention

Efforts should be made by those who are in high authority or experts to make sure that all aspects or topics are covered in that particular Grade. This then suggests that there is a great need for monitoring and intervention both inside and outside the classroom situation with the purpose of motivating, encouraging and giving support where necessary. Inside the classroom, it can be done through class visits and checking teacher's portfolios (preparation, work schedule, work programmed etc.) and also learner's portfolios (exercises, tests and assignments) regularly. Outside the classroom, it can be done through workshops, cluster meetings and learning area or subject meetings for the purpose of exchanging and sharing ideas that teachers experience in their

different classroom situations and to motivate and give courage for those who are not competent. Furthermore to help each other, find out good methods and strategies for dealing with difficult aspects or topics like the one in this study of solving word problems.

### 5.2.2 Integration or Team work

Due to learner's lack of English proficiency in the learning and teaching of Mathematics, I therefore suggest that there should be an ongoing practice of English language as the language of instruction in most subjects, except in Afrikaans and vernacular language classes by all teachers. Teachers should make emphasis at words which hold the same spelling and pronunciation in different subjects. They should strongly emphasize that the sameness of the words holds different meanings in different subjects. Furthermore the teacher should state how the word differs from his or her subject to the other subjects.

I usually do this activity in a form of a play. For instance, I write this symbol '+'. I then gave learners different titles like Pastor, Traffic Police, Social Science teacher, Maths teacher and Nurse. I then asked them to give the name of the same symbol according to their titles. The pastor answered "cross", traffic "4 way stop", social science "direction", Maths teacher "plus" nurse "clinic or hospital". If all the teachers can do this activity honestly in their classroom situation learners will be able to differentiate the same words in different subjects with good understanding of words' meanings depending on the subject. Moreover, there should be a good team spirit of all other teachers of other subjects who teach in English with English teachers.

Teachers should also work as a team in all Grades (Grades 5, 6 and 7.) rather than as individuals. Teachers should assist each other in identifying learner's abilities and difficulties in the process of their learning. This shows that an

integration of different learning areas of subjects can be regarded as an impatient learner rescued for learning mathematical language meaningfully with a required understanding. The study has shown that there are mathematical words/terms expressions in mathematical language which do not mean the same as everyday use of English and other learning subjects. In addition to teaching learners basic mathematics concepts is one of the educational approaches that can be regarded as useful and meaningful for solving mathematical problems. Teaching learners basic concepts focused on learners' conceptual understanding rather than memorizing facts and rules to get the right answer.

### 5.2.3 Creating an effective classroom situation

Creating an effective classroom environment which requires learners to be proficient in both languages, the subject knowledge is more taxing and demanding from the teachers' perspective. The teacher is the key figure in the teaching and learning situation than learners themselves. The research that has been conducted by Addler (2001); Khisky (1995), Moschovich (2002), Setati (2002) has largely focused more on teachers perspective than learners' perspective as they were aware that the success of learners is upon teachers' shoulders. It is believed that for learners to be successful in solving mathematical word problems, teachers should possess such good qualities of teaching word problems effectively and meaningfully to the learners. Meaningful in the sense that those teachers should present word problems using learners' everyday experiences rather than experiences that are familiar to them.

The researcher was aware of the fact that word problems are meaningful to the learners if they are presented on their everyday experiences. That is the reason why she presents word problems on this study based on learner's everyday experiences. Unfortunately learners did not get the meaning of the problem due to the findings found and mentioned in Chapter 4 above.

According to this study, and other studies such as Addler, (2001) and others, they perceived teachers as the main and important agents and tools that learners may profitably use than any other tools for good performance and achievement. However, the study is mainly focused on learners' perspectives than teachers' perspectives.

#### **5.2.4 Good facilities and extra learning activities**

The study then recommends that, the problem of lack of proficiency in English as learners second language can be easily but slowly resolved by a well-developed school library with good and simple English books with interesting stories, Science and Mathematics dictionaries which can help learners to improve their understanding of mathematical language. Furthermore, debates, drama and dialogue on mathematical topics or concepts should also be encouraged by Mathematics teachers and English teachers. Therefore good cooperation or team work between teachers of different and same subjects is more important than an individual teacher focusing only in his or her subject as already stated in 5.2.2.

#### **5.2.5 Teacher's factor**

Poor performance in the study perceives teachers as the main contributing factor to learners' persistence of poor performance in solving mathematical word problems. There was a general complaint among learners that they were not taught how to solve word problems. The researcher felt that there was a need for learners to be taught the aspect of solving word problems.

### 5.3 CONCLUSION



Although this study was conducted at a smaller scale, the results are consistent with the findings of similar research carried previously such as Spring, (2002) and Burwell, (2000).

Central to the discussion of the findings of the study, it has been found that learners experienced difficulties when solving mathematical word problems amongst Grade 6 learners. As stated earlier the study sought to investigate difficulties Grade 6 learners experienced when solving mathematical word problems as measured by a written test on word problems only. The results showed that learners had difficulties in solving word problems. This was shown by learner's poor performance in the test as indicated in two tables in chapter four. Even though the study was focused on learners' perspectives rather than teachers' perspectives, it was found that learner's poor performance in solving word problems were mainly attributed by teacher's lack of teaching word problems in their mathematics classroom situation.

Teachers reasons for not teaching word problems were indicated as: mathematical word problems were difficult for them as teachers and therefore how can they teach learners something which they did not understand; Learners were struggling with numerical problems which they regarded as simple, what more if they added upon them a complicated and difficult aspect of solving word problems. Learners learnt what they were taught by their teachers in their classrooms. Lack of teaching word problems by teachers put learners on a disadvantage platform of not performing well in the test. Again lack of proficiency in the English language and poor understanding of mathematical language and words were also parts played by the teachers.

The role of the teacher projected as the main factor for these difficulties. Lack of teaching word problems in a Mathematics classroom situation was strongly associated with learner's poor performance in the test. An important issue pertinent to learner's poor performances on solving word problems were within lack of proficiency in the language of teaching and learning which was English and lack of understanding in mathematical language. In this regard learners therefore, faced a dual challenge at the same time: that is learning English as a second language which is unfamiliar to them hence learning mathematics as a subject with its own specific language different from everyday usage of common English language.

#### 5.4 REFLECTION

The study showed that learners were struggling to learn more than one thing which they were not familiar to them simultaneously and that is the language of instruction which is English and also learning mathematics as a body of knowledge which uses its own specific language different from everyday language. Moreover, teachers did not teach the aspect of solving word problems in their teaching and learning situation. It is not surprising that the all the learners performed badly in the test for all 10 schools which participated in the study.

*Mathematics as profound and beautiful which makes sense to them.*

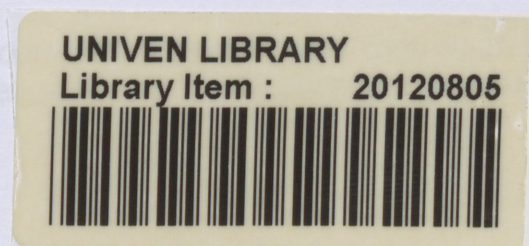
Learners were expected to function in all three aspects: proficiently, effectively and efficiently without being taught by their teachers. OH? What a disaster that one can imagine. For these learners it becomes more frustrating and difficult for them to solve those problems in the written test. That is the reason why many questions were not answered at all by most of the learners. On the other hand word problems in their own nature are difficult. Barwell, (2004) showed that mathematical word problems involved difficult words and language to understand than words and language used in numerical problems.

From the findings and conclusions drawn from the study, the study explored three critical roles on teacher's dimension:

- It is desirable that a teacher is the main figure for successful achievement in the learning and teaching situation.
- It is desirable that a teacher must be an expert in mathematical knowledge.
- It is desirable that a teacher be an expert in mathematical problem solving.

#### 5.4 REFLECTION

The study stimulated the researcher to further her studies on the same topic of solving mathematical word problems investigating the difficulties from teachers' point of view rather than learners. The researcher believes that the future findings and their recommendations together with the current findings on learners' perspectives will change the world of Mathematics. Furthermore, they will make the coming generation to enjoy solving mathematical word problems for both learners and teachers. On the other hand they will experience the whole Mathematics as profound and beautiful which makes sense to them.



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13. 35 packets of sweets have a mass of 52.5kg. What is the mass of each packet if each packet has the same mass?
14. Calculate the difference between the sum of 58 and 204 and the product of 148 and 24.
15. Vhuawelo took 2 hours and 18 minutes to finish his homework and Vele took 3 hours 5 minutes to finish his homework. How much longer did Vele take to finish?
16. What is the different between 15 hours 42 minutes and 8 hours 48 minutes?
17. Benny scored 23 out of 50 for his Maths test. What was his percentage?
18. Find the perimeter of rectangle whose length is 7cm and the breadth is 3cm.
19. Write in numerical form: six hundred and thirty-one thousand eight hundred and six.
20. Emily and Mpho are baking cake. They have to mix  $2\frac{3}{4}$  cups of sugar. How many cups of the flour and sugar be together?
21. The grade 6 learners at Vhufuli Primary School are voting for a new group leader. Half way through the voting process they drew this pictograph to show the votes for each candidate.

**KEY: ☺ = 30 VOTES**

VUSI	THINA	REMBU	SINDI
			☺
	☺		☺
☺	☺		☺
☺	☺	☺	☺
☺	☺	☺	☺

THEN ANSWER THE FOLLOWING QUESTIONS FROM THE ABOVE GRAPH

- a) How many votes does Vusi have?
- b) How many votes does Thina have?
- c) Which one of them has the most votes at this stage in the voting?
- d) What is the different between Rembu and Sindi's votes?
- e) Can you tell which learner will win election? Explain your answer.

## MATHEMATICS QUESTIONNAIRE

GRADE 6 LEVEL

TIME: 2 HOURS

**NB: ANSWER ALL QUESTIONS**

1. The classroom was decorated with 54 red balloons and 48 green balloons. Find the total number of balloons.
2. By how much is 9214 less than the sum of 374 and 561
3. Muofhe buys 354 oranges. She packs them in small bags of 6 oranges each. How many small bags can she make?
4. Sarah bought 3,50m materials for a dress and 1,25m for shorts. How many metres of materials did Sarah purchase?
5. Vhuyo has R30 pocket money. He spends  $\frac{1}{6}$  of his money on a pen and  $\frac{1}{3}$  on sweets. How much money left?
6. If today is Monday, what day of the week will it be 25 days from today?
7. Tshifhiwa took about 3 hours 15 minutes to make a wire car. How long will it take to make 12 cars?
8. Decrease 8745 by 2197
9. Peter and John were born in the same year, but John was born 78 days before Peter, if John was born on 15 July, on what day will Peter's birthday fall? (Show your calculations).
10. Dakalo weighs 43kg and Lufuno weighs 43000g. Who weighs the most?
11. A car uses 3 litres of petrol to drive 15km. How many litres will be needed to drive 90km?
12. A new pencil is 120mm long. Every time it is sharpened it becomes 4mm shorter. How many times can you sharpen this pencil until it reaches the length of 20mm?

APPENDIX A



LIMPOPO  
PROVINCIAL GOVERNMENT  
REPUBLIC OF SOUTH AFRICA

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P.O. BOX 2794  
SIBASA  
0970  
13 July 2009

THE DISTRICT MANAGER  
DEPARTMENT OF EDUCATION  
VHEMBE DISTRICT  
THOHOYANDOU  
0950

Dear Sir

REQUEST FOR PERMISSION TO CONDUCT RESEARCH

The above matter has reference:

I am a part time student at the University of Venda for Science and Technology, busy with a Master Degree in Mathematics Education. I hereby ask for permission to conduct research in Primary Schools of Tshinane Circuit.

The research instrument involves learners in grade 6 level. The topic of my Research is: **DIFFICULTIES GRADE 6 LEARNERS EXPERIENCE WHEN SOLVING MATHEMATICAL WORD PROBLEMS.**

Learners will be given a questionnaire which consists of 25 items of mathematical word problems to solve. The purpose of the research is to find out what difficulties do learners hold when solving word problems.

It is the hope of the researcher that the result, and recommendation from this study will hopefully be of value to grade 6 Mathematics Educators in the aspect of word problems.

Yours Faithfully  
SITSULA TSHISIKHAWA MARY.

APPENDIX B



# LIMPOPO

PROVINCIAL GOVERNMENT  
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Ref: 14/7/R

DEPARTMENT OF EDUCATION

Eng: DR M.G. NEKHUMBE

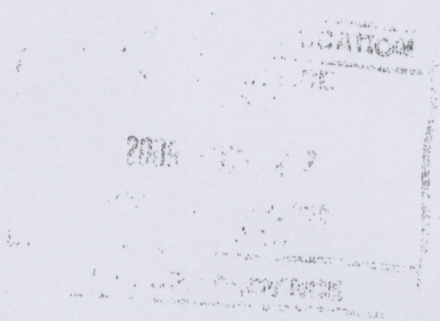
TEL:0159625716

SITSULA TSHISIKHAWE MARY

P.O.BOX 2784


SIBASA

0970



### REQUEST FOR PERMISSION TO CONDUCT RESEARCH

1. The above matter refers.
2. Your application to do research in Primary Schools of Tshinane Circuit in Vhembe District has been granted.
  - 2.1 Please note the permission is granted on condition that the research is done outside contact time to avoid lesson disruptions.
  - 2.2 This serves to introduce you to the Circuit Manager and Schools.
  - 2.3 The Schools should also be contacted well in advance before the visit.
3. Wishing you a successful study.

  
.....

27.01.2009  
.....

DISTRICT MANAGER: EDUCATION

DATE