Mathematics teachers’ perceptions of the problem solving teaching approach at ordinary level: the case of one district in Zimbabwe

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BINDURA

ZIMBABWE

JUNE 2015
APPROVAL FORM

The Undersigned Certify that they have read the dissertation and have approved its submission for marking after conforming that it conforms to the requirements of the department of Education Faculty of Science Education

Supervisor’s Signature___________________

Date__________________________________
DECLARATION FORM
I hereby declare that this thesis has been as a result of my own original efforts and investigations and such work has not been present elsewhere for the purpose of degree assessment. All additional sources of information have been acknowledged by means of references

Student Signature_______________________________

Date__________________________________________
DEDICATION

This research is dedicated to my two beautiful daughters, Tinevimbo and Tinatswe to my cousins Caroline and Catherine, Because of you I have taught. My mother and Mbuya vaMilton, if you were not around I could have been a nobody.

I love you all
ACKNOWLEDGEMENTS

I want to give God praise for holding me high, without him I could be nothing. My heartfelt thanks are directed to my supervisor Mr Ndemo, without him this paper could not have been a success. I’m also indebted to Mr Hahlani O S for the support and Mr Shumba S for taking his time to go through my literature review and his constructive comments. I could also to extent my heartfelt thanks to who took part in this study

Jah bless, Jah guide
ABSTRACT

This study investigated teachers’ perception of the problem solving approach as a teaching strategy in the subject of Mathematics at ordinary level. Specifically, the study wanted to gain an insight of the root causes of poor performance in Mathematics at ordinary level. The following four research questions guided this study, (i) what challenges are faced by teachers when using problem solving as a teaching strategy in Mathematics at ordinary level? (ii) What are the teachers’ conceptions of the problem solving strategy as a teaching approach? (iii) What role does experience play in teacher perception of the problem solving teaching strategy? (iv) What gender difference exists in teacher perception of the problem solving teaching strategy at ordinary level?

The study used a questionnaire and a semi structured interview as data gathering instruments. The questionnaire was used to establish teacher perceptions and the interview schedule focused mainly on challenges encountered and understanding of the concept problem solving as a teaching approach. A total of twenty –eight teachers drawn from the district took part in the study, of twenty-five of which were males and three were females. The descriptive research design was used in order to make generalisation of a small sample of teachers.

Data collected from research instruments was presented in tables and analysed using axial coding for easy analysis and interpretation of results. The study found out that, teachers’ perceptions are influenced by experience, challenges they encounter in teaching Mathematics and the conceptions held by teachers of the problem solving teaching approach. This study did not find gender as influencing teacher perceptions.
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CHAPTER ONE

THE PROBLEM AND ITS CONTEXT

1.0 Introduction.

The major problem that most African mathematics educators face is how to effectively use the constructivist teaching strategy to improve student performance well prior to instruction. In Zimbabwe for example, the problem of low pass rates is a perennial problem and urgent measures are needed to overcome this problem. A lot has been said about making Mathematics better understood by the learner but with little success. Recent researches in Mathematics education have tried to integrate technology in the teaching and learning of Mathematics.

1.1 Background to the study.

The perennial problem, that Zimbabwean mathematics educators have to grapple with, is that of poor showing in mathematics, at examinable levels that is, grade seven, ordinary and advanced level. Mathematics being the mother of all sciences and alongside the sciences is a key component in the technological advancement of any nation, and its poor showing is a cause for concern, be it politically or within the academic circles. Several mathematics educators have researched on different ways of teaching Mathematics, with the aim of making Mathematics better appreciated and well understood by the learner. In order for one, to teach mathematics more effectively one needs a sound knowledge of various teaching strategies and their merits and demerits. The Zimbabwe School Examination Council for example, in its ordinary, advanced and primary level syllabi emphasises use of problem solving in the teaching and learning of Mathematics. Foreexample in its methodology section the Mathematics 4008 syllabus for 2013 to 2017 has it that ‘a deliberate attempt be made to teach problem-solving as a skill, with pupils being exposed to non-routine problem solving
situations’. This emphasis leaves one to ponder whether teachers are well acquainted with this teaching strategy or simply put do they really know what problem solving is? Current trends in mathematics education have been one that attempts to put more emphasis on the use of problem solving in Mathematics teaching and learning. If problem solving is given the right weighty that it is deserves, then one wonders why we still have high rate of mathematics failures.

If teachers have different teaching strategies at their disposal and resources have been availed to them then why do we still experience low pass rates in mathematics? In 2011 the Zimbabwean Government with the assistance of the Ministry of Sports Education and Culture, the Transition Fund and the UNICEF embarked on a mission which equipped all schools with core text to be used in schools of which Mathematics as a core subject was one of the subjects that benefitted. This improved the pupil textbook ratio to one as to one; the target was to alleviate textbook shortages which were associated with poor showing at both levels of the education system in Zimbabwe. Five years down the line the pass rate has not improved and even in privately owned schools which are well equipped the pass rate is still a cause for concern. This clearly shows that there is missing link, between pupils performance and teacher knowledge of teaching, something that teachers are failing to do, that is using bad teaching strategies. Below is a table showing trends in mathematics performance in one school in Mwenezi District.

Fig 1

<table>
<thead>
<tr>
<th>Year</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passrate in%</td>
<td>24</td>
<td>22</td>
<td>38</td>
<td>42</td>
<td>32</td>
</tr>
</tbody>
</table>

Source: Lundi high result analysis
From the above information it is quite clear that performance in mathematics is a cause for concern. In comparison to the School pass rate of the above years Mathematics was below the school pass rate.

One needs to understand that teacher’s disposition is very important on what he or she is going to do, and that the learning and teaching process is thus a result of his/her disposition. Teacher conviction is important in the teaching and learning process. He or she determines the method he or she is going to use. Thus it is the view of this researcher that problem solving as a teaching strategy is hardly used in Zimbabwe Secondary Schools. Rosenberg and Kosslyn (2003) argue that for one to solve a problem one needs a strategy, an approach to solving a problem determined by the type of representation and the processing steps to be tried. Shumba (1998) concludes that there is high positive relationship that exists between methods used and pupil performance. A study carried by Jaji in (1991) reveals that in Zimbabwe most teachers use question and method, work from the textbook and teacher demonstration. Some people argue that Mathematics is about problems and finding solutions to those problems. In light of the above assertion, it could seem reasonable to use problem solving in the learning and teaching of mathematics.

It is the view of this researcher that teachers are hardly using this teaching strategy in the learning of mathematics in their classrooms. Thus the Zimbabwe mathematics education needs a re-examination and the reasons of the re-examination, is that of poor showing and high dropouts at ordinary level. According to Rebori (1993) problem solving is an ongoing process that is an integral part of work and life. The implication is that one cannot run away from using problem solving as a teaching strategy since it overlaps into other spheres of life other than Mathematics. This is further supported by Concannon and Keller (1998) when they argue that the ability to solve problems is a basic life skill and is essential to understanding technical subjects.
1.2 Statement of the problem

It has rather been a tradition in Zimbabwe that when ordinary level results are out, mathematics has the lowest pass rates. This has been accepted as a norm in Zimbabwe. The possible causes have been researched on, and possible solutions suggested to these failures, and hence we still experience low pass rates in Mathematics. Then one wonders whether teachers are using the best teaching methods that enable learners to make mathematical statement more meaningful to them. Thus this study will seek to examine the perception of ordinary level mathematics teachers on the use of problem solving as a teaching strategy. This researcher is of the view that mathematics is not taught the way it should be.

1.3 Research question.

What perceptions are held by ordinary level teachers on the use problem solving as a teaching strategy in the teaching and learning of Mathematics? The following are the sub problems.

1.3.0 Sub problems

1.3.1 What are the challenges faced by teachers when using problem solving as a teaching strategy in the teaching and learning of Mathematics at ordinary level?

1.3.2 What are the teachers’ conceptions of the problem solving strategy in the teaching and learning of Mathematics?

1.3.3 What role does experience play in teacher perception in the use of problem solving as a teaching strategy in the teaching and learning of Mathematics?

1.3.4 What gender differences exist in teachers’ perceptions of the problem solving method as a teaching strategy at ordinary level in the teaching and learning of Mathematics?
1.4 **Purpose of the study**

The study seeks to educate the teacher on the best possible ways of teaching and learning of Mathematics. The study will also highlight the probable teacher incompetence’s in the teaching and learning of Mathematics and probable solutions to that incompetence. The ultimate goal of Mathematics educator’s effort in investigating problem solving is to find ways in which to improve students’ abilities to solve problems (Thompson in Silver (ed) 1985). He further argues that it is particularly important that we view the teacher as someone who behaves rationally in making pedagogical decisions about the content and how to present it to the learners. Hudson (2007; 2) asserts that “teaching strategy shapes the learning environment, and an effective teacher selects a particular teaching strategy or set of strategies to engage students in learning.” The study is biased towards the teacher, and hence meant to benefit teacher by improving his/her teaching strategies. If the best possible method is made available this will also benefit the learner since the teacher will be using methods that enable the learner to grasp Mathematical concepts more easily. The research will greatly improve the body of knowledge in the teaching and learning of Mathematics amongst teachers, it will also improve performance prior to instruction.

1.5 **Importance of the study.**

The importance of mathematics can never be overemphasised be it in our lives or in the world of academia; it cuts across all the fields of human endeavour. It is the view of this researcher that Mathematics is wrongly taught in secondary schools and given the correct methodology it could help in the scientific development of Zimbabwe. Mathematics is the mother of all sciences hence if passes in mathematics improves this in variously leads to technological advancement of Zimbabwe. According to the UNDP report of (2000) at independence 1957 Ghana’s Gross Domestic Product (GDP) was at par with that of South Korea but a few years
later South Korea is far much ahead compared to that of Ghana and this has been attributed to the methodology used in the teaching and learning of Mathematics. South Korea’s emphasis is on developing an individual who can participate in the technological advancement whilst the Africa Ghanaian’s emphasis is on rote learning. The result is that rote learning leads to churning out of engineers who cannot even develop a mere borehole that can alleviate water shortages. One then wonders what type of education we are arming our graduates with. One of the aims of the Zimbabwe School Syllabus for Ordinary level Mathematics stipulates that learners should be able to participate in the technological advancement of Zimbabwe, but this will remain a pipe dream until, unless the approach used in the teaching and learning of Mathematics is changed for the better.

In 1957 Russia successfully launched into space the satellite Sputink. This precipitated a major renewal of Mathematics and Science curriculum in the in the USA, (Schoenfeld 1992). According to Schoenfeld a ten year renewal was launched and by 1980 it was deemed a failure because it emphasised rote learning and produced generation of students who performed dismally on measures of thinking and problem solving. There was a major shift towards problem solving and it was recommended that problem solving be the focus of school Mathematics. This has clearly motivated this researcher to find out whether Mathematics is being done the way it should be done or we are doing it the USA way prior to 1980, which clearly means we are lagging behind our counterparts in the developed world in the teaching and learning of mathematics.

1.6.0 Delimitations of the study.

1.6.1 Physical Delimitations

The republic of Zimbabwe is made up of ten provinces which are divided into fifty-nine Districts. Of the fifty-nine districts only one is going to be chosen for the study. Not all the
schools are going to part of the study due to limited time but only four schools closer to the researcher.

1.7.0 Limitations to the Study

The following are the limitations that might impinge on the validity of the project:

The study is going to focus on the teacher, who is teaching mathematics in, four secondary schools in one district in Masvingo province, hence the results might not be generalised to those teachers taking other subjects other than Mathematics. Assessing the presence of a perception in an individual is difficult, as human behaviour is unpredictable and hence some respondents can give conflicting responses some of which might not have to do with the research and make whole process look invalid. The research problem does not consider the teachers’, qualifications and the background of the learners and hence this might have a bearing on the whole project as it becomes difficult to apply particularly with trained and experienced teachers. The research also, does not consider the nature of the school one is teaching at and as such the generalisation might be difficult to apply to some schools with better performers than others as teaching methods employed or used might be different. The time is another factor here, because one’s perception tends to change with time and can thus not be generalised to longitudinal studies. In order to overcome these limitations the researcher is going to use random sampling because it includes all the participants with their different traits.

Triangulation is going to be used in this project in order to increase instrument validity. Researcher will also personally hand over questionnaires to respondents in order to make sure that all the questionnaires are returned.
1.8 Assumptions

The study made a few assumptions which were:

1 Every pupil is capable of passing Mathematics if well taught.

2 Teacher’s positive perception towards problem solving as a teaching strategy will result in improved performance.

3 It is assumed that all the respondents are faithful and will give correct information to the best of their knowledge and abilities.

4 Teacher’s predisposition towards an instructional method affects his or her teaching, in the teaching and learning of Mathematics.

5 It is suggested that pupils’ positive perception of teachers’ work directly influence or promotes pupil participation and learning of mathematics.

1.9.0 Definition of terms

**Problem solving**: is an obstacle that requires a strategy to overcome it in order to reach a solution

**Strategy** is an approach used to overcome a problem, a method used to overcom a problematic situation

**Problem solving** is a process that one initiates to overcome a problem and reach a goal.

**Perception** is the way one looks at things, views or understands something, or an idea that one holds about a certain event.
1.10 Summary

This chapter looked at the background to the study, statement of the problem and the sub problems in order to make scenario clearer to would be readers of this study. The major highlights of this chapter were trying to show the importance of this research to the general Mathematics educators. The assumptions were made clear so as to validate data gathering techniques. Terms were defined in context of this research so as to make would be readers understand the research in a more detailed manner. The next chapter will address Literature review that is what research reveals about perception of teachers in problem solving as a teaching strategy.
CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter, the researcher will begin by defining what problem solving is. The chapter will also look at various models in problem solving and their influence on the following, gender, experience and qualification, on teacher perception on the use of problem solving as a teaching approach.

2.2 Definition of Problem Solving

According to the Teacher Vision (2015) problem solving is a process, an on-going activity in which we take what we know to discover what we don’t. It involves overcoming obstacles by generating hypothesis, testing those predictions, and arriving at satisfactory solutions. They further argue that problem solving should be a very real part of the curriculum because problem solving presupposes that students can take on some of the responsibilities for their own learning and take personal action to solve problems, resolve conflicts, discuss alternatives, and focus on thinking as a vital element of the curriculum.

According to Mayer and Wittrock (2006:287) problem solving is “a cognitive process directed at achieving a goal when no solution method is obvious to the problem solver.” They argue further that problem solving consists of four parts, which are (1) problem solving is cognitive, that is, it occurs within the problem solver’s cognitive system and can only be inferred from the problem solver’s behaviour. (2) It is a process, which involves applying cognitive representations in the problem solver’s cognitive system. (3) It is guided the problem solver’s goals and (4) it is personal, that is depends on the individual knowledge and skill of the problem solver. According to the New Zealand Ministry of Education (2010)
bulletin problem solving are things to try out that do not guarantee solution to a problem. They are in actual fact generalisations that might work for a number of problems.

Stanic and Kilpatrick (1991) look at problem solving from a variety of perspectives. They argue that problems have occupied a central place in the school Mathematics curriculum since antiquity, but problem solving has not, only recently have mathematics educators accepted the idea that the development of problem solving ability deserves special attention. With this focus on problem solving has come confusion. The term problem solving has become a slogan encompassing different views of what education is of what schooling is, of what Mathematics is and of why we should teach mathematics in general and problem solving in particular.

2.3 Models in Problem Solving

Polya (1957) in his famous book How To Solve It came up with a process model for problem solving as an ability. He came up with a four step model of problem solving process namely, understanding the problem, devising a plan; carrying out a plan, and looking back. (a) **Understanding a problem**, what is unknown to that problem, what is the data? What is the condition? Is it possible to satisfy the condition? Is the condition sufficient to determine the unknown? (b) **Devising a plan**- find the connection between data and unknown, do you know a related problem, any useful theorem and look at the unknown. (c) **Carrying out a plan**- examines the solution obtained, check the results, can one or someone derive the solution differently. (d) **Looking back**- can one make conclusions from the results? Can the argument be checked and validated? Can the result be used to tackle more problems? However Lester (1985) argues that Polya’s model serves as a framework for identifying a multitude of heuristic processes that may foster successful problem solving.
Crews (2007) has the following problem solving strategies that are derived from Polya’s problem solving process: (a) look for patterns (b) use a model (c) form an equation (d) draw a diagram (e) construct a table or graph (f) guess and check (g) account for all possibilities (h) simplify work backwards, use logical reasoning and examine related problems.

Burton (1982) puts forth a model of mathematical thinking which she used as the basis of her study. It comprises of a “mathinking” helix which contains an unspecified number of loops which build upon understanding and awareness achieved in traversing loops. Burton (1982:14) asserts that the operations and process of Mathematical thinking are essential to learning (and that) an expanding field for learning depends upon continuously improving and deepening awareness. Branca in Silver (1985) support this point when he notes that mathematical thinking can be taught and practical considerations are given regarding the implications of the model.

Biggs (1973) came up with three guidelines for sound learning which are (i) free exploration (ii) directed discovery led by teacher questions focused upon a particular concept. He further claims that those learning through investigation are accustomed to problem solving situations and do not find problems difficult, and they can be expected to use far more imagination as they grow older. Jeffrey (1978) who was a British theorist proposed a model for teachers to use in lesson development. His model is based on the following tenets, (1) experimentation (2) formulation and testing of conjectures about relationships and (3) formulation of explanation for observed rules.

Reiff and Heller (1982) came up with a prescriptive model of effective human problem solving in the domain of physics and studied one component of the model, the process of generating useful initial description of any problem. According to them, generating of initial description can be broken down into two, a person generates a basic description of the
problem, which summarises explicitly the information specified and wanted in the problem, introduces useful symbols, and expresses the relevant information in convenient symbolic representation, and secondly the theoretical description. Heller and Hungate in Silver (1985:93) say that a theoretical description of a problem is a description deliberately expressed in terms of special concepts and properties in the knowledge base for the problem.

These models can be used in Mathematics education to help learners become masters of their destiny. Polya’s model is highly applicable in the Zimbabwean context and problem solving as a teaching approach can be used in the teaching and learning of mathematics.

2.4 Perceptions of Teachers’ on instructional problem solving

Krulik and Reys (1980) noted that teachers’ behaviour, when faced with such instructional situations, may be a manifestation of consciously held notions and deliberately chosen methods, or may be a manifestation of unconsciously held belief system that have evolved out of teachers experience. Krulik and Reys (1980) also observed differences in the way they relate to use of problem solving as a teaching strategy in teachers’ practises regarding the role of problem solving in the mathematics curricula. Some teachers in the USA did not regard problem solving competence as a desirable or important goal of teaching mathematics, hence neglected it.

Kennedy and Tips (1991) contend that centering mathematics instruction on paper and pencil exercises, speed drills, and trial tests is uninspiring and contribute to children’s dislike of mathematics. This point is further supported by Anderson (1998) who argues that teachers reported that they frequently use chalk and demonstration showed a reliance on more traditional, teaching approaches. Billstein, Liberskind and Lott (1981:2) stated that “many teachers dislike problem solving mainly because they have not had success in solving problems.” Charlesworth (1996:28) says “development of problem solving is a long term
activity, it is not learned in one lesson........many teachers are not prepared to spend time teaching the rigorous problem solving process, and some teachers do not have the skill of problem solving”. Minton (1991:214) assert that “the other problem is that problem solving is very slow, teachers easily become impatient, I remember well a student saying sir, why don’t you just give us the answer, it is quicker?

Teaching strategies can produce the desired goals of making students learn with understanding if a variety of teaching methods are used (Knoller1991). Palmer (2005) believed that the use of a variety of teaching methods, especially constructivist ones, empowers learners with skills of independent thinking and problem solving. Palmer further argues that classroom practice is highly likely to be more effective when informed by an understanding of how students learn. This calls for teachers to have a working understanding of and ability to apply constructivist-informed teaching methods in the classrooms.

A study by Tabulawa (1998) found out that perceptions that teachers hold influence their classroom practises. He cited assumptions about the nature of knowledge and the way that knowledge ought to be transmitted visa vie perceptions of students. He goes on to say that they tend to perpetuate teacher centred approaches as opposed to learner centred practises. He further observes that teachers’ perceptions of goals of schooling have a direct influence in the way teachers teach because teachers see themselves as the main transmitters of knowledge

2.5 Influence of teaching experience on Teachers’ Perception of Problem Solving As A Teaching Approach or Method.

Academic qualifications are considered predictors of teachers’ ability to understand and teach a subject effectively (Lingred 1976). Watson (1990) points out that it is necessary for pupils to be given opportunities to be taught by well qualified Mathematics and Science Teachers. A case study by Uche and Umoren (1998) revealed that qualification is an important
determinant in how a teacher perceives areas of difficulty in teaching. Accordingly if a teacher is less qualified he or she will not be well acquainted with use of problem solving as a teaching strategy. Teacher qualification determines his or her predisposition on the use of problem solving as a teaching approach. However this is in contrast with Edu et al (2003) in their study of perceptions of primary science teachers on difficult topics. They found that academic qualification does not significantly influence perception of difficult topics. However, Jegede(1992) argues that teachers with lower education qualification will definitely implement the curriculum the wrong way because of lower skills and experience. Whilst Esu and Ntukidem (1977) have found that recruitment of teachers should not only be based on mere certificates but should be accompanied by an aptitude test, which assess their competence in the subject. This implies that academic qualification alone does not really have an influence on a teacher’s ability to implement curriculum materials.

Methodologies that a teacher uses are related to the quality of a teacher, highly qualified teachers have strong pedagogical knowledge (Darlington, Hammonds and Sykes 2003). The above assertion shows that experience is a strong factor indetermining the instructional strategy that one uses. The more experienced teachers will choose strategies that impact knowledge to learners easily or they will use constructivist teaching approaches.

A study carried out by Jussim, Eccles and Madon (1996) found that teacher expectations and perception had a significant effect on sixth grade students’ grades and performance on a Standardized Mathematics Assessment. The expectations and perceptions varied according to qualification and years of experience in the teaching and learning of mathematics. Whilst Ferguson concludes that effects of teacher expectations and perceptions could be substantial if the effects are to accumulate from Kindergarten to high school.
A report by Amiral and Halai (2010) found out that 63% of teachers irrespective of whether they are professionally qualified or not or whether they are novice or experienced teachers considered mathematical knowledge as ‘truth’ where mathematical rules can never be proved wrong. This view influences teacher’s teaching practise, for example, if a teacher believes that mathematical knowledge can never be proved wrong, then this view might not allow them to give space to students to analyse mathematical knowledge and critically think differently.

Research on mathematical problem solving has concentrated on cognitive, rather than affective issues (Mcleod in Silver 1985). Affective domain implies feelings, emotions beliefs that have some relationship to student performance in problem solving activities (Mcleod1981) Lester (1980:229) lists “interests, motivation, confidence, perseverance and willingness to take risks as affective domains”. Haladya et al (1983) identified fatalism as an important variable in their model of attitudinal factors. Fatalism “is the tendency to accept the fates as determining outcome”.

A study carried out by Isler and Cakiroglu (2009) indicated that teachers with eleven to fifteen years and twenty one and more years of experience had significantly higher perceived utilization of special techniques than teachers possessing ten or less years of experience. They further found that teachers with sixteen to twenty years of experience possessed significantly higher perceived utilisation of special techniques than teachers with five or less years of experience, therefore the more experienced teachers were expected to integrate special techniques more frequently than the less experienced teachers.

Teachers’ professed perceptions are influenced by their knowledge and interpretation of advice about teaching, by their use and understanding of curriculum materials and by their own experiences as learners of mathematics (Putman 2003). This point clearly shows that,
what teachers do in the classroom is a manifestation of held beliefs and perception of the constructive teaching process. This point is further supported by Pajare(1992) who suggested that belief are held in different intensities, and that beliefs influence perception in that they filter situations to make them more comprehensible. A study by Anderson(2000) on teacher belief and perception placed Lois(pseudonym) as traditional teacher. Lois had been teaching for twenty years, Lois reported that she seldom uses problem solving approaches in her lower ability Mathematics classes since the students need practise on basic skills and generally find problem solving difficult. She further contends that if she was teaching an A class then the strategy would change in accordance with needs of the child. She further emphasises that the constraints she felt from the class itself were a major determinant of her teaching approach. Lois further revealed that problem solving is applicable to only a limited type of students and in her case more able students.

However in a similar study of perceived constraints on teacher’s problem solving beliefs and practices Judy (2000) found that Mary (pseudonym) who had been teaching Mathematics for four years, was using constructivist approach, and taking a mixed ability class unlike Lois. The reason why Mary used constructivist approach was because he was teaching a mixed ability class. When Mary was interviewed on her perception on the constructivist teaching approach she pointed out that her initial enthusiasm in using problem solving approaches in mathematics was influenced by her experiences in pre-service education courses and embraced most of the advice from the problem solving literature as a teaching approach. This study by Judy (2000) shows that experience does not affect the use of problem solving as a teaching approach and that gender has no effect on the choice of teaching methods.

However Simpson, Koballa, Oliver and Crawley (1992) in Pajares (1994) asserts that when considering teaching strategies, experienced teachers understand the powerful influence of the teacher’s affective domain. This includes the teachers’ emotions, motivations, attitudes
and values. A teacher who displays enthusiasm for teaching Mathematics and Science demonstrates positive emotions of Mathematics and Science which can influence students’ attitudes. This study is in variance with that of Judy (2000) who sees experience as of no significance in the choice of teaching approach but the quality of the students one is teaching determines which approach to use. This point is further supported by Sullivan et al (2002:656) who assert that “teachers need to become more aware of specific, common aspects of teaching that may not be optimal for certain groups of pupils, and then address these when working at improving their atypical patterns of interaction in Mathematics classroom, approaches to teaching that they decide to use purposefully need to be made more explicit to the children so that potential for confusion is reduced and reasons for using particular strategies are well understood.”

Bishaw (2010) in his study of teacher beliefs and perceptions found that, teachers did not get in-service, or pre-service training about problem solving as a teaching approach and some had read it in literature, hence level of education and qualification influences the level of actual practise in problem solving. He further contends that teacher’s low level of perception and practise with regard to applying this problem solving as teaching method resulted from lack of knowledge to the area of problem solving as a teaching approach. In a study carried out by Rudhumbu (2014) on Zimbabwean Mathematics primary teachers, he found that thirty per cent of the teachers use the problem solving method most of the time during their teaching of Mathematics, while thirty per cent use some of the times, forty per cent of the teachers do not use the method. He further suggests that the reasons may be due to lack of knowledge which makes it difficult to apply the method. He also says it might be as a result of lack experience. This point is further supported by Isaacs (1996) who posited that teachers seem to have a propensity to use teacher centred as opposed to learner centred approach. From the study by Rudhumbu(2014) it is quite evident that Zimbabwean teachers in primary
school hardly use constructivist teaching strategies irrespective of qualification, experience or gender.

A research conducted by Penuel, Fisherman, Yamaguichi and Gallagher (2007) revealed that the qualification of a teacher determines his or her competence in the classroom. They further argue that teachers with professional qualification tended to associate and commit themselves more to curriculum implementation requirements of which problem solving as a teaching approach is one. However they further argue that this stance is negotiable or contestable given that there have been counter arguments that an individual’s qualification per se cannot and should not be discounted. Penuel, et al (2007) argues that professionalism and non-professionalism are closely linked to teacher qualification. With this view in mind one can safely say that the qualification of a teacher influences, his or her use of constructivist teaching approach in Mathematics.

Ipaye (2002) contends that teacher qualification affects curriculum implementation. He also further argues that the relationship between years of experience on the job and teaching approaches has not been a recent phenomenon and it is contestable. Hanushek(2003) contends that the issue of teacher experience and perception have been researched on widely in both developed and developing countries. He further argues that past research has shown that teacher experience has a more positive relationship with quality teaching or implementation, but still the overall picture is not that strong. Hanushek (2003) also pursued a nonparametric investigation of experience, and found that effects of teaching approach taken are only concentrated in the first few years of teaching.

The teacher’s major role in the teaching and learning of Mathematics is to implement the curriculum; curriculum implementation involves choice of instructional strategies used by the teacher in the teaching and learning process. The perception, preconception, teaching
experience and teacher qualification are a predisposition about how he or she is going to implement curriculum materials. This point is supported by Woods (1996) who came up with a framework for curriculum implementation diagrammatically shown below.

![Diagram](image)

This framework shows that experience, perceptions, and teacher qualification play a critical role in the teaching and learning process. That is to say, how one implements the curriculum, his teaching methods whether traditional or constructivist is determined by one’s very time qualifications, experience of teaching the subject and his or her own disposition. Woods (1996) further argues that what teachers do in their classroom is shaped by what they think, and that teachers’ perceptions and beliefs serve as filters through which instructional judgements are made. This point is supported by Owusu (2012) who contends that it is significant to realize that their perceptions about the materials they implement contribute in no small way to how well they implement the curriculum.

Xenofontos and Andrews (2000) explored the problem solving perceptions of individuals entering into their undergraduates primary teacher education programs. The study consisted of twenty-seven undergraduates from two different countries: Cyprus and England. Individuals were interviewed the first week of their University courses, prior to any formal
instruction on mathematics. The findings indicated that student’s perception was aligned with the type of instruction they experienced in their respective countries. Cyprians perceived that problem solving instruction incorporated real world tasks and is the best method to use during teaching and learning. This is in variance with other known researches which tend to support the notion that more experienced teachers choose methods which are constructive than the less experienced teachers. This brings another variable which is of interest, the background of the teachers as determining the methods one is going to use. If one has been exposed to traditional methods and they have been successful with them, they will adopt those methods in their teaching. This point if further supported by Brooks and Brooks (1993) who argue that becoming a teacher who helps students to search rather than follow is challenging and, in many ways, frightening, Teachers who resist constructivist pedagogy do so for understandable reasons: most were not themselves educated in these settings or trained in these ways.

A comparative study by Andrews (2000) found that it is difficult to compare across nation in respect of qualification because the manner in which teachers are trained and their qualifications vary significantly. In Britain the prevailing mode of entry to secondary teaching is a subject degree followed by a year’s teacher training. In Hungary teachers train to work in primary phase and qualify as secondary teachers by means of attendance. This clearly shows that qualifications as determining teacher perceptions on the use of problem solving can only be possible within systems. However Andrews(2000) in a similar study found that there are no differences between graduates in mathematics and those teaching other subjects in their perceptions about the use of problem solving as a teaching approach, the most significant differences occurred between teachers with higher degrees and those without. What we can draw from Andrews (2000) is that qualification indeed determines teacher’s perceptions on the use of problem as a teaching approach and those with higher
degrees tend to use problem solving more often than those with first degrees or diploma holders.

Howes (1997) found that teacher factors such as professional status and experience have reported positive influence on teacher’s choice of constructivist approach. Teachers who are more experienced have a positive tendency of using constructivist approaches as compared to the less experienced. A study by Rotumoi and Too (2012) reveals that perception of teachers towards instructional methods is determined by teacher qualification. Qualifications play an important role in teaching because they influence instructional competence and may also help identify the existence of instructional problems in the classroom.

In their study of teacher perceptions of inquiry based instruction Taylor and Bilbrey (2011) found that one method employed for increasing positive perceptions of inquiry based instructions is the reorganization of teacher education programs. This point is further supported by Barnett (2006) who argues that introducing preservice teachers to inquiry based instruction before they begin their teaching careers and then following the new teachers through early implementation phases of inquiry-based instruction, the number of practising teacher with positive perceptions of inquiry-based teaching will increase. Whilst Ernest (1989) found that teachers’ perceptions of their teaching is a valuable variable in promoting effective teaching and learning of mathematics as what the teacher teaches and the way he/she teaches is a reflection of the experiences and beliefs he or she holds. He further argues that good subject knowledge and the kind of perception that the teacher have toward Mathematics determines how he or she teaches. Ahmed and Aziz (2009) in their study found that teachers’ perception of their teaching and how they teach is of great importance in measuring the effectiveness of Mathematics teaching and learning and it also reinforces teacher’s decision making.
A study carried out by Lipka et al (2005:382), showed that “positive perceptions held by teachers of the inquiry-based learning are due in part to long term positive relationship between teacher and students, that contribute to a classroom environment in which trust and mutuality were constructed”. Teachers who have positive perceptions of instructional programs often have greater job satisfaction and are far more likely to utilise emerging instructional technologies to further the learning gains possible through inquiry based instruction. (Kong 2007 in Taylor and Bilbery 2011). This is further supported by Alsup (2005) who asserts that in addition to increasing student motivation and, in turn, achievement, inquiry based instruction in mathematics is shown to spur greater teacher self-efficacy, which leads to more positive teacher perceptions of inquiry-based learning while increasing the likelihood that continued implementation will be maintained.

The issue of teacher experience and qualification from the above literature shows that it is interwoven. This is to say that various perceptions held by teachers determine how an individual implements the curriculum. They is little evidence according to literature that supports that perceptions and experience are not related.

2.6 The influence of Gender on Teacher Perception of Problem Solving as a Teaching Approach

A study by Dermrtas and Donmez (2008) revealed that there exist some meaningful discrepancies between problem solving teaching approach and gender. These discrepancies were found to vary according to qualification and experience. They identified choice of content and method used in the teaching and learning of Mathematics as notable discrepancies. This was further supported by Katkat (2001), who found that the discrepancies between problem solving approaches to teaching and learning mathematics and gender. Katkat (2001) further points out that the discrepancies might have arisen as a result of using
maybe different backgrounds of the novice teachers. This study is invariance with other known researches which show that there is no gender difference in teacher perception in using problem solving as teaching approach.

A study by Edu et al (2012) was put on an independent t-test analysis of the influence of gender on teachers’ perception of teaching of difficult topics using problem solving in Primary Science Curriculum.

Fig 3 Perception of teaching difficult topics.

<table>
<thead>
<tr>
<th>Sex</th>
<th>N</th>
<th>X</th>
<th>Sd</th>
<th>T test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>197</td>
<td>139.03</td>
<td>17.02</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>285</td>
<td>138.18</td>
<td>15.06</td>
<td>0.56</td>
</tr>
<tr>
<td>Total</td>
<td>482</td>
<td>138.52</td>
<td>15.88</td>
<td></td>
</tr>
</tbody>
</table>

P > 0.5
Crit t = 1.96 df 480

The critical value of 0.56 is less than the critical t value of 1.96 at 0.5 level of significance with 480 degrees of freedom. This implies that teacher’s perception of problem solving in the teaching of primary science does not significantly influence gender. This study reveals that they are no gender difference in the perception of primary science teachers in the use of problem solving as a teaching approach. Slaven (1996) concludes that differences between males and females in Mathematics are due to motivation and not perceptions about how mathematics is taught. Edu et al (2012) contend that given equal motivation, cultural opportunities and academic qualification both females and males are likely to perceive problem solving in similar terms. This point is supported by Rudy (1982) who found out that, what is required of a teacher is the knowledge of the subject, necessary to teach and not gender.
Morgan (1978) asserts that neither males nor females are superior in overall intelligence. Oyedeji (1992) in his study found that teachers’ gender is not a factor in teaching, that others factors like environment, attitude and others also affect how teacher perceives the process of learning. Edu et al (2012) further notes that difficulties women have with problem solving are probably due to culturally held views and not lack of ability. From this researcher’s point of view, dealing with women in the teaching and learning of Mathematics there is little evidence to support the notion that males are superior or perceive problem solving differently. This point is further supported by Edu et al (2012) who argue that there is little evidence to suggest that the perception of teachers taking mathematics is a result of gender, but some attributes which are culturally determined like enjoyment, and modelling where the environment is rich in male domination.

A study by Taiwo in (2009) on teachers’ perceptions of the role of media in the classroom teaching in secondary school found that gender did not have significantly effect on the perceptions of teachers about the role of media as an instructional tool. This is in line with Olawepo (1984) who found that gender as a variable did not affect teacher’s perception of problem solving as an approach in social studies. Whilst Parks (2004) contend that female teachers are field dependent and technophobia, while male teachers are field independent and prefer application of media to instruction. In a study by Andrews (2000) on the influence of teachers’ conceptions of instruction it was found that women were more convinced than men that Mathematics teaching required pedagogic variety, the creation of a Mathematically challenging classroom environment and were more positive in respect of Mathematics as an essential life tool. This point is further supported by Harvey et al (1961) who argue that teachers who have different conception systems show differing teaching styles.
2.7 Challenges to effective problem solving

Howard (2012) argue that developing effective student problem solving skills to present to student, has been an on-going challenges for educators. Some students for example may have difficulties in organization, while others experience reading comprehension issues. In the same vein, Keller and Concannon (1998) came up, four barriers to effective problem solving, emotions, student learning styles, gender and ability of the learners. Emotions, they argue, pupils seriously question their ability to solve problems effectively, and may avoid courses that involve problem solving altogether because of these concerns. They argue further that overcoming these fears and anxieties is the first step in learning to solve problems effectively a step that instructors ignore.

Kimura (1992) argue that some thinking styles are affect ability to solve problems are gender linked. A marked discrepancy exists between males and females in visualising the structure of chemical molecules because males are better able to manipulate three dimensional objects in space. However, females organize and relate data more efficiently than males.

2.8 Summary

Perceptions related to the use of problem solving as a teaching approach have been reviewed in this chapter. As a result, of this review this particular study is going to find out whether teacher perceptions affect the teaching and learning of Mathematics in one district in Zimbabwe. The next chapter is going to describe the different research methodologies, with emphasis on, research design, population targeted, instruments used and their merits and demerits as tools for data collection. The chapter will also look at how data is going to be analysed, presented and interpreted.
Chapter Three

3.0 Research Methodology

3.1 Introduction

The main focus of this chapter is to present the procedures, methods and techniques on how data is collected. This chapter also includes the methods which were used to select subjects to be studied. This chapter will also highlight the merits and demerits of using selected research instruments. Most of the data was collected using questionnaires and interviews. Data presentation and procedures on how data is presented and analysed are highlighted in this chapter.

3.2 Research Design

A research design is a plan and strategy of investigating conceived ideas so as to obtain answers to the research questions (Saunders, Lewis and Thornhill 2007). This view implies that a research design is used by the researcher to guide him/her answer the research questions by providing necessary tools or instruments that gathers information. This view is supported by Dollit (1984) in Leady (2001) who views a research design as an overall plan for obtaining answers to the research questions. Babbie (2004) argues that research design is a method used in collecting data from a representative sample of individuals using instruments composed either close ended and or open ended questions, observations and interviews.

Burns and Grove (2003:195) define a research design as “a blueprint for conducting a study with maximum control over factors that may interfere with the validity of the findings”. Parahoo (1997:142) describes a research design as “a plan that describes how, when and where data are to be collected and analysed”. Polit et al (2001:167) define a research design
as the researcher’s overall overview for answering the research question or testing the research hypothesis. This study is going to focus on teacher perceptions on the use of problem solving as a teaching strategy; the research design will give this researcher a blue print on how to answer the following research questions.

(i) What challenges are faced by teachers when using problem solving as a teaching strategy

   In the teaching and learning of Mathematics at Ordinary level

(ii) What are the teachers’ conceptions of the problem solving strategy in the teaching and

   Learning of Mathematics at Ordinary level?

(iii) What role does experience play in teacher perception in the use of problem

   Solving as a teaching strategy in the learning and teaching of Mathematics at ordinary level?

(iv) What gender differences exist in teachers’ perceptions of the problem solving method as

   a teaching strategy at ordinary level in the teaching and learning of Mathematics?

This study used the descriptive survey method. Mtetwa (2003) contends that assessing the presence of an attitude or perception in particular aspect of mathematics in an individual requires one to corroborate the individual’s behaviour, some of which may be covert, with the individual’s cognitive and affective responses to various manifestations of that aspect of mathematics. The quality of investigation that entails such kind of assessment can be enhanced by a methodology that provides opportunities for one to observe and probe individual’s thought process. Mtetwa further notes that descriptive survey method allows opportunities for one to probe and observe one, and allows a limited number of individuals to be studied with the aim of making conclusions that cover the generality of the whole
population. Babbie (2004) also contends that survey research designs are designed to provide a snapshot of the current state of affairs and to discover facts about a population. Chiromo(2006) contends that descriptive survey is a method of research which describes what we see. Brink and Word(1998) contend that survey is able to show relationship among variables that can be easily quantified, it uses more reliable data collections tools, it is extremely quick and has error rates and it can be used for one time collection of vast amount of data on a selected population. Sampling is the lynch pin of descriptive survey method.

The questionnaire and interviews were used in the descriptive survey to gather data. Njerekai (2005) contends that a questionnaire is a set of open ended, closed or multiple choice questions which respondents have to respond to. A questionnaire is the most suitable instrument that can be used to collect data about teacher perception; a semi structured interview will be used as a means of data validation. Interviews will help the investigator get reactions to respondents’ preconceived notions. According to Merriam (2001) interviewing is necessary when the required information cannot be observed such as feelings beliefs perceptions and opinions. The interview is meant to solicit perceptions of problem solving as a teaching approach. Merriam (2001) further asserts that interviewing is a better technique to use when conducting case studies of a few selected individuals.

The research design bears plan and procedures that help the researcher to obtain empirical evidence about variables under study. The descriptive research design was used for this study in an attempt to find answers to three research questions which guided this study. The fact that Mathematics teacher’s perceptions on problem solving as a teaching strategy are sought to be established, implies that the research is descriptive in nature. The descriptive design is going to be used since it goes beyond a mere description of individuals and attempts to describe Mathematics teachers perception’s on problem solving as a teaching strategy at ordinary level.
3.3 Population and Sampling.

3.3.1 Population:

Population refers to individuals, objects or events that are considered in a research project (Chiromo 2006). Saunders et al (2007) views target population as the full set of elements from which a sample is drawn. Population refers to participants in a research projects. In this project participants are going to be drawn from one district in Zimbabwe. These might be individuals or institutions represented by people who can respond to the required information because they have knowledge of a particular field. The participants are going to be teachers currently teaching Mathematics at selected schools in the district. The population consisted of sixty-five practising teachers drawn from the district.

3.3.2 Sampling

Sampling was done because studying the whole population is not feasible given the limited time and resources. Judgemental sampling is a sampling technique used to obtain information using subjects who are most advantageously placed or in the best position to provide information sought (Saunders et al 2007). Judgemental Sampling is a non-statistical method of choosing respondents based on appropriateness for the study. Sampling is vital in descriptive survey since not all elements can be considered, due to financial constraints and time. In this research Judgemental sampling was used to choose participants, only those teachers, teaching Mathematics at Ordinary Level in the district will be part of the survey. This is actually a deliberate method of choosing respondents for a particular study and generalisations made concerning a particular population of interest.
3.4 Research Instruments

The chief research instrument used in this study is the Questionnaire. A semi-structured interview was also used to validate information from the Questionnaire. The Questionnaires consisted of open ended and closed questions as well as likert like type of responses. The open ended questions were meant to solicit for opinions and other preconceived ideas about problem solving as a teaching approach. The first four questions of the Questionnaire sought to establish teacher background, such as teaching experience, qualification and gender. This will answer research questions which sought to find out whether teaching experiences influences use of problem solving as a teaching approach. Part two of the Questionnaire dealt with the survey on perceptions on problem solving as a teaching approach. The interview schedule is an analysis of survey responses aimed at probing, teacher qualification, challenges and its influence on the teaching approach, the role of problem solving in the teaching and learning of mathematics and any other preconceived opinions about problem solving as a teaching approach.

3.5 Questionnaire

Njerekai (2005) defines a questionnaire as a set of open ended, closed or multiple choice questions which respondents has to respond to. Newman (2006) argues that questionnaires are a set of series of printed questions that are handed or mailed to respondents who complete them on their own, and giving their own judgement. Best and khan (1998) contends that a questionnaire is a set of questions presented to the respondents for answers. Questionnaires, do gather information that helps to answer the research questions. It is quite clear from the above authors that, a questionnaire consists of a set of questions that are procedurally structured and organised, easy to understand and answer, help solicit for information required from the respondents.
One of the advantages of questionnaires is that respondents can answers questions in the comfort of their homes, and that there is uniformity of questions attempted over so many respondents and this enhances research validity. The questionnaire consisted of both closed and open ended questions. Open ended questions were used to enable respondents to elaborate their answers in detail. In the closed or restricted questions, the likert like type of questions were used to find out the extent to which respondents agree with required information. The other advantage of questionnaire is that it is a very easy method of data collection, that is required data can be gathered in less time compared to other methods of data collection and that data from a lot of respondents can collected within a short period of time. The likert types of questions are going to be used to restrict the respondent’s views, but the responses given are easy to analyse and interpret. The major drawback observed on likert type of questions is that even those who had problems on understanding what problem solving is, went on to answer questions on things which they did not understand is all about.

The main disadvantage of questionnaires as data collection tool is that it is very difficult to construct. A good questionnaire should be coherent, procedural and well-ordered showing relationship from one question to the other. Ericker(1970) notes that questionnaires have some limitations in the sense that the researcher depends on the good will of the person questioned to supply the answers. According to Ericker (1970) if they exist bad blood between the researcher and the respondent, inaccurate information is likely to be provided, which might render the project invalid.

The advantages of using questionnaires outweighs their disadvantages and hence in a bid to find perceptions of teachers in the use of problem solving as a teaching approach questionnaires were used as instrument for data collection.
3.6 Interviews

Saunders (2007) contends that interview technique involves presentation of oral-verbal stimuli and reply in terms of oral-verbal responses. Haralambos (1990:507) argues that “interviews provide more opportunity to discover what the respondent really means…and the interviewer can probe for shades of meaning”. Njerekai (2005) writes that personal interviews are a purposeful conservation between interviewer and respondent. All the above authors acknowledge that there is verbal exchange of ideas between the interviewer and the interviewee. Data hence can be gathered in this manner if the respondent gives information to the best of their abilities and researcher can also check for inconsistencies in responses by following gestures of respondents. This method was used as a tool for data validation.

According to Chiromo (2006) there are two types of interviews namely, the structured and unstructured. The structured type was used in this research project. In structured interview the researcher structures question in order in which the respondent should answer them. The respondent has little freedom on how to attempt the questions but is guided by what is being asked, this is good since the respondent will not respond to what has not been asked for. This is supported by Chiromo (2006) who asserts that structured interviews consists of a list of specific questions in which the interviewer does not deviate from his questions or inject any extra remarks in the interview process. Saunders et.al (2007) described structured interviews as those interviews where questionnaire is based on a predetermined and standardised set of questions.

In this research personal face to face interview was used. Burns (1998) defined personal interviews as face to face surveys which can be subdivided into on site, telephone and office interviews. Personally administered interviews enabled the researcher to establish rapport
with the interviewees, an element that is vital in motivating participants so that they can give as much information as possible devoid of bias.

### 3.7 Data Collection Procedure

Data collection plan /procedure refers to the steps that are going to be followed in the process of collecting and gathering data as well as how it is going to be interpreted. The purpose is to obtain data on teacher perceptions on the use of problem solving in Mathematics at Ordinary Level as a teaching approach in one of Zimbabwe’s district. The researcher first sought permission from the District Education Officer, and permission was granted the researcher proceeded to drive to the selected schools for data gathering and collection.

The researcher personally visit the four schools and introduce himself to the head by means of a letter from the University and one from the District Education Officer, which sought permission to carry out an educational research, and one which granted permission to carry out the research. After permission was granted the research went on to meet Mathematics teachers and introduce himself and purpose of his visit. The researchers then personally handed over the Questionnaires to the teachers and allowed them time to complete. This opportunity also allowed the researcher to make appointments for interviews with the selected teachers. The researcher drove to another school and repeated the same process. After all the schools have been visited the researcher then, interviewed with each teacher from each of the participating schools. Finally the researcher thanked the participants for their contribution.

The sample for teachers nearest schools was too small, only seven and hence this researcher used the district mathematics panels to hand over the questionnaires. All in all thirty –two participants took part in the research and twenty-five were handed questionnaires on the day of panel. Due to limited time interviews could not be carried out on the day and only the
seven visited in their respective schools were interviewed. Of those who were interviewed about twenty-eight returned their questionnaires with the other four giving endless excuses, which forced this researcher to treat them as unreturned questionnaires.

3.8 Data Presentation and Analysis Plan

Data collected is meaningless unless it has been analysed so that recommendations can be drawn from the analysed data. This point is supported by Bell who argues that data collected by means of questionnaire, interviews diaries or any other method mean very little until they are analysed. First of all, the researcher checked the number of items completed and those not completed. When the item on the questionnaire was not completed, the researcher coded it under no responses column on the frequency table which was constructed for analysis. Data on likert type questions was analysed by grouping those with agree and strong agree together for easy analysis of the data. The researcher employed both axial and open coding in categorising and breaking data. Saunders (2007) described axial coding as the act of grouping related concepts to together. The researcher used axial coding in combining data collected from questionnaires and that from interview. Open coding was used when breaking apart data that is unrelated and headings written. Frequency tables were constructed and total number of responses on each item of the questionnaire was expressed as a percentage. Data which was obtained from interviews and open ended questions was be grouped into classes for analysis. The groups were meant to answer the four research questions.

In order to make meaningful data analysis this researcher is going to use pseudo names when making analysis of data from open ended questions from questionnaires. Names such “Mr Moyo, Miss Chuma and cetera will be used to capture and quote their views.
3.9 Data presentation Procedure

The data collected was presented in the form of pie charts and tables. A percentage for likert like type of questions was calculated and formed a basis for the presentation of data on tables and pie charts. A brief comment accompanied each pie chart and table. The comments will draw meanings to what information is presented above.

3.10 Validity and Reliability

In order to increase reliability and validity of instruments the researcher worked closely with the population in data gathering. Also before the questionnaires were administerd they were given to other practising mathematics teachers outside the target population to check their effectiveness. According to Oppenheim (2000), an instrument is valid if it measures what it purports to measure. The use of both questionnaire and interview was meant to ensure validity and reliability of results.

3.11 Ethical Considerations

Ethics refers to the standard and behaviour expected of a group as described in groups code of professional conduct (Pera and Van Tander,1996) in( Chiromo 2006). Chiromo (2006) further asserts that research ethics are the principles of right and wrong that guide the researchers when conducting a research. The researcher is not going to divulge the name of the District, the schools visited and names of respondents. Confidentiality and anonymity will be observed, throughout the study.
3.12 Summary

For this study the researcher developed two instruments for data collection, namely questionnaire and interview schedule. Instruments used were discussed and validated in order to authenticate the data collected through these instruments. Issues discussed in this chapter included, the research design, population, sampling, data collecting procedures, and presentation. The next chapter is going to look at how data was collected and analysed so that it makes meaning.
CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.0 INTRODUCTION

The main focus of this chapter is to present findings on teacher perception on the use of problem solving as a teaching strategy in one district in Zimbabwe. Two instruments were used in data collection in this project, namely interview and questionnaire. The findings from questionnaires administered to respondents are summarised in tables, item by item, processed as percentages and trends identified and discussed. Results from interviews will be presented in narrative form. It is hoped that after thorough analysis of the findings, an answer to how teachers perceive problem solving as a teaching strategy will be found.

4.1 Background Information of Respondents

Table 1 Response Rate from Questionnaires

<table>
<thead>
<tr>
<th>Respondent</th>
<th>Questionnaire distributed</th>
<th>Questionnaires Answered</th>
<th>% Response</th>
<th>% variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordinary Level</td>
<td>35</td>
<td>28</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>Mathematics Teachers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>35</td>
<td>28</td>
<td>80</td>
<td>20</td>
</tr>
</tbody>
</table>

Table 1 above shows that thirty-five questionnaires were distributed and twenty-eighty were completed and five were uncounted for, whilst two were returned uncompleted.
Table 2  Age of Respondents

<table>
<thead>
<tr>
<th>Age</th>
<th>Number of Respondents</th>
<th>% Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 to 29 years</td>
<td>5</td>
<td>17.86</td>
</tr>
<tr>
<td>30 to 39 years</td>
<td>9</td>
<td>32.14</td>
</tr>
<tr>
<td>40 years and above</td>
<td>14</td>
<td>50</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.2 above shows that, for sampled teachers 50% (n=14) were over 40 years old, 32.14% (n=9) were between 30 and 39 years and 17.86% (n=5) were between 20 and 29 years.

Table 3 Highest Professional Qualifications

<table>
<thead>
<tr>
<th>Professional Qualification</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>number</td>
</tr>
<tr>
<td>Certificate in Education</td>
<td>2</td>
</tr>
<tr>
<td>Diploma in Education</td>
<td>16</td>
</tr>
<tr>
<td>Graduate C E</td>
<td>3</td>
</tr>
<tr>
<td>Bachelor of Education</td>
<td>6</td>
</tr>
<tr>
<td>Master of Education/MSc Ed</td>
<td>nil</td>
</tr>
<tr>
<td>Any Other</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
</tr>
</tbody>
</table>
The survey results from Table 3 show that of the sampled teachers, 57.14% (n=16) have Diplomas, 7.14% (n=2) Certificate in Education, 10.72% (n=3), 21.42% (n=6) Bachelor of Education, and 3.57% (n=1) had any other degree.

4.2 Data Presentation and Analysis

This section deals or addresses research question number one:

“What are the challenges faced by teachers when using problem solving as a teaching strategy in the teaching and learning of Mathematics at ordinary level”

The majority of the respondents came up with two types of challenges, Teacher and Child which influence teacher perception on the use of problem solving as teaching approach.

Table 4 shows Teacher related challenges.

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Percentage Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>79</td>
</tr>
<tr>
<td>Resources</td>
<td>67</td>
</tr>
<tr>
<td>Low Efficacy</td>
<td>36</td>
</tr>
<tr>
<td>Large Class Size</td>
<td>54</td>
</tr>
</tbody>
</table>

The results from Table 4 show that teachers came up with four factors which they perceive to influence or hinder successfully implementation of problem solving as a teaching approach. Most of the respondents were of the view that time is a major factor which hinders successful implementation of problem solving, since the curriculum is examine oriented. This tallies with results obtained from the likert type of questions were, 75% of the
respondents agreed or strongly agreed that problem solving as a teaching approach is time consuming and while 25% disagreed or strongly disagree. One of the respondents, Mr Moyo, said,” It is equally time consuming and may be costly. If expectations are not met it may cause frustration on pupils and controlling space is difficult yet one has to complete the syllabus in time”. In the same view, Miss Chipo, has this to say “curriculum is time framed but this method requires time”. These findings are in line with what Charleworth (1996) has found. He observes that development of problem solving skills as a long term activity: is not learned in one lesson…… many teachers are not prepared to spend time teaching the rigorous problem solving process and some teachers do not have the skill of problem solving. Minton (1991:214) says that “ the other problem is that problem solving is very slow, teachers easily become impatient, I remember well a student saying sir why don’t you just give us the answer it is quicker?

The issue of resource in Mathematics educational research has played a pivotal role since time immemorial, but the question still remains, on how we can harness these resources so that pupils can demonstrate an improvement? About sixty-seven per cent of teachers were of the view that resources play a pivotal in successful implementation of problem solving as a teaching strategy. One of the respondents, Mr Jecha, said, “it requires more resources and in schools these are limited”. Ms Chipo was more specific on the type of resources, and she opens, that, it requires an environment reach in teaching materials such as textbooks, learning classrooms and teachers”. Thus there is a consensus amongst sampled teachers that for problem solving to be effective as a teaching approach there is need for both material and non-material resources.
In a study by Lingred (1976), it was found out that teachers are predictors of students’ ability to understand and learn subject more effectively. Watson (1990) points out that it is necessary for pupils to be taught by well qualified Mathematics and Science Teachers. He further argues that material resources should be availed to make the work of the teacher easier. In Zimbabwe most of the schools are mannered by teachers who are not knowledgeable in the subject, hence this cannot use problem solving since it requires one with a strong base of the subject matter. In this study two of the respondents could not describe problem solving, showing that they cannot use it in the teaching and learning of Mathematics.

There other challenge which did not gain prominence with respondents is that of low efficacy and incompetence. A small percentage of respondents (thirty-six per cent) indicated that teachers do not understand how the method works and what is all about. Mr chuma, said, “I have difficult in understanding this method. What I know is that it is a constructivist method of teaching, so asking me to use this method is of no use”.

Fifty-four of the teachers indicated that the classes are too large for successful implementation of problem solving as a teaching strategy. Mr Jecha also indicated that “it is impossible in Zimbabwe, because of the large classes; I’m teaching classes of between forty to fifty pupils and I can’t burden myself with that type of method”. This point is supported by Anderson (1998) who argues that teachers reported that they frequently used chalk and demonstration. They showed reliance on more traditional teaching methods.

The study has shown that teachers came up with four major challenges, which influence teachers’ perception of the problem solving approach. These are time, resources, low efficacy and large class size.
Table 5 Shows Pupil related changes and percentage response.

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Percentage Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude of learners</td>
<td>39</td>
</tr>
<tr>
<td>Social Background of Learners</td>
<td>65</td>
</tr>
<tr>
<td>Ability</td>
<td>78</td>
</tr>
</tbody>
</table>

The Table above shows three challenges which teachers view as main challenges to successful implementation of the problem solving method as a teaching approach. The main factors which came out of teachers were ability of learners, social background and attitude of learners. Social background and ability of pupils were the major challenges sited by respondents. One of the respondents, Mr Choto, said, “it is mostly suitable for gifted and creative students”, whilst Mr Hoto, said, “the method appeals to learners with a sound foundation and understanding of the subject otherwise pupils may not enjoy the method”.

These findings are similar to those found by Anderson (2000) on teacher perception and belief about problem solving as teaching approach. He found that Lois(Pseudo) who has been teaching Mathematics for twenty years seldomly uses problem solving approaches in her lower ability Mathematics classes. Lois revealed that problem solving is only applicable to only a limited type of students and in her case more able and gifted students. However, in a similar study by Anderson Mary(pseudo) who was teaching a mixed class was using problem solving because these was influenced by her experiences in pre-service education courses.
These findings have revealed that the challenges to successful implementation to problem solving as a teaching approach can be classified into two major groups; those that are teacher centred and pupil centred. Resources, large class size and time as those challenges attributed to the teacher while social background and ability of the students as those challenges attributed to students.

**This section deals with or addresses research question number two:**

What are the teachers’ conceptions of the problem solving Strategy in the teaching and learning of Mathematics?

Table 6 shows teacher Conceptions:

<table>
<thead>
<tr>
<th>Theme</th>
<th>% Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>constructivist</td>
<td>80</td>
</tr>
<tr>
<td>Polya Model</td>
<td>44</td>
</tr>
<tr>
<td>Discovery Method</td>
<td>60</td>
</tr>
</tbody>
</table>

The Table 6 Shows that teacher conception can be viewed from three themes, about problem solving as a teaching approach. About 80% were of the view that problem solving is a constructivist teaching approach, 44 % of them describe it in terms of Polya’s Model and 60% viewed it as Discovery Method. Two of the respondents could not describe what problem solving is, and hence their results were discarded for further analysis. Most of those who described problem solving approach in terms of Polya were those who were given questionnaires in their respective schools and the majority of those who answered in
terms of Discovery or Constructivist were those, given questionnaires on the day of the district Mathematics seminar.

One of the respondents, a Mr Peter, said, "Problem solving is a teaching technique or method which is aimed at developing the learners into carrying out basic stages in addressing any mathematical problem by first understanding the problem, find a way or method to solve a problem, carry out the plan and look back by checking if the plan yielded the correct results". Whilst Mr Choto, said, "is a teaching and learning method in which an individual is involved in using his mental processes” and Ms Chipo, said,” The problem solving method guides pupils in approaches to solve problems in four basic steps: (a) understanding the problem (b) devising a plan of the problem (c) carrying out the plan (d) Looking back stage.

Bishaw (2010) opens that teacher’s level of perception and practise with regard to applying problem solving as a teaching method result from lack of knowledge to the area of problem solving as a teaching approach. Tabulawa (1998) in his study of teacher perceptions on problem solving found that knowledge of problem solving and the way it is supposed to be implemented rests on the teacher for success of students.

Findings also revealed that most of those who were able to define problem solving were diploma holders, and those with higher qualification had difficulties in describing problem solving. This is in contrast with some research findings, which states, that higher academic qualification are predictors of ability to understand and teach subject effectively Lingred (1976). However, Jegede (1992) argues that teachers with lower educational qualification will definitely implement curriculum the wrong way because of lower skills. This is
supported by Darlington, Hammonds and Sykes (2003) who argue that methodologies that teacher use are related to the quality of a teacher, and highly qualified teachers have strong pedagogical knowledge.

The failure by some respondents to describe problem implies that no problem solving teaching approaches are taking place in schools. This is shown again by results from the likert scale were 76% of respondents strongly agreed that teachers need in servicing in the use of problem solving as a teaching method and about 55% agreed that most of the teachers do not have understanding of problem solving as a teaching strategy. These findings show that most of the teachers have a veneer idea of what problem solving is and let alone how to use it in the teaching and learning of mathematics.

**This section deals with research question number three:**

What role does experience play in teacher perception in the use of problem solving?

Table 7 Teaching Experience

<table>
<thead>
<tr>
<th>Number of years in the service</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>Less than 5 years</td>
<td>0</td>
</tr>
<tr>
<td>5-10 years</td>
<td>3</td>
</tr>
<tr>
<td>10-15 years</td>
<td>7</td>
</tr>
<tr>
<td>More than 15 years</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
</tr>
</tbody>
</table>
Table 7 shows that for the teachers sampled, 11 (n=3) 5-10 years, 25 % (n=7) 10-15 years and
64 % (n=18) more than 15 years of teaching experience.

Most of the respondents indicated that they used constructivist teaching approach which
can be said to be an indicator of the number of years in the service. However, when it
comes to the rate they often use problem solving in the teaching and learning of
Mathematics, 68% said that they used it frequently and 32% occasionally. This shows that
almost all of the sampled teachers use problem solving or have used problem solving at one
point in the teaching and learning of Mathematics. A study by Hanushek (2003) in both
developing and developed countries has shown that teacher experience has a more positive
relationship with quality teaching or implementation of the curriculum materials. He also
further pursued non parametric investigation of experience and found out that they are
concentrated in the first few years one is teaching.

These findings have shown that experience determines teacher perception in the choice of
teaching methods. However Ipaye (2002) argues that the relationship between years of
experience on the job and teaching approaches is negotiable and contestable.

This section addresses research question number four:

What gender differences exist in teachers’ perception of the problem solving method as a
teaching strategy at ordinary level in the teaching and learning of Mathematics?

Most of the sampled teachers were males (90%) and females (10%). This shows patriarchal
dominion in the field of Mathematics teaching and learning. The three females who
participated responded in similar fashion to their male counter parts. One of the female
respondent, Ms Tau, on answering the question what is problem solving said,“ it is the way
of tackling a given situation by discovering. One is given a situation and discovers what is
unknown and gives a solution to the given situation”. In the same light Mr Jojo, said,
“present pupils with a problem and children work on the problem on their own to discover
the solutions”.

Ms Chipo, said, “lack of resources such as teaching material and qualified teachers” are the
challenges that hinder successful use of problem solving as a teaching approach. Mr Goto,
said, “It requires more resources and in the schools there are limited resources and slow
learners will not be able to grasp the concepts”. In terms of preference of teaching methods
all the females indicated that they prefer constructive teaching approaches. When the
females are compared to their male counterparts it has been found that 66% of
them occasionally used problem solving method compared to their male counterparts with
59%. On issues such as ways of promoting problem solving, justification of problem solving
as an instructional tool and the need to in service teachers it has been established there is
no marked differences in views from both females and males.

There is no evidence to suggest that there exist gender differences in teacher perception of
the problem solving approach. Oyedeeji (1992) in his study found that teachers’ gender is not
a factor in teaching, that other factor like environment, attitude and many more also affect
how teacher perceives the process of learning. In another study by Olawepo (1984)
concluded that gender as a variable did not affect teacher’s perception of problem solving
as an approach in social studies. Whilst Slaven (1996) concludes that differences between
males and females in Mathematics are due to motivation and not to perceptions about how
Mathematics is taught.
Zimbabwe being a developing country is not isolated from the rest of the world in terms of teaching approaches in Mathematics. What applies to other developing countries also apply in Zimbabwe. Thus gender as a variable does not affect the process of teaching Mathematics at ordinary level.

4.3 Summary

This chapter analysed and presented data from questionnaires and a semi structured interview. Data validity was achieved through triangulation. The study revealed that, there are no gender differences in teacher perception of the teaching method, various conceptions held by teachers of the problem solving approach such as it constructivist method and that experience indeed play a pivotal role in the choice of teaching approach. The next chapter is going to look at summary of the findings as well as making some recommendations and conclusions for further research.
CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The main focus of this study was to explore on Mathematic teachers’ perception of the problem solving approach at ordinary level. This chapter summarises the findings of chapter four. The findings will be summarised following findings from each research question. From these findings recommendations and conclusions will be drawn.

5.1 Summary

This study was guided by the following research questions:

1 What challenges are faced by teachers when using problem solving as a teaching strategy in the teaching and learning of Mathematics at ordinary level?

2 What are the teachers’ conceptions of the problem solving as a teaching approach at ordinary level?

3 What role does experience play in teacher perception in the use of problem solving at ordinary level in the teaching and learning of Mathematics?

4 What gender differences exist in teachers’ perceptions of the problem solving as a teaching approach in Mathematics at ordinary level.

Statistics from this study showed that twenty-eight respondents took part in this study and three of them were females and twenty-five were males. Most of the respondents were holders of diplomas in education and only eleven per cent of the respondents were holders
of non-teaching Mathematics certificates. Most of the respondents were quite well
experienced in teaching the subject at ordinary level; about 89% of them had experience
ranging between ten years and over. Questionnaire and a semi structured interview were
used as data gathering instruments.

5.2 Summary of findings from research question one.

The challenges cited by teachers were grouped into two major groups, teacher and pupil
related. Under teacher related challenges the following were revealed, teacher efficacy,
time allocated to teaching Mathematics, large classroom sizes and resources. Of these, time
allocated and resources both material and non-material proved amongst teachers as major
challenges that impinge upon their use of problem solving approach.

Pupils related challenges include attitudes of the learners, social background and ability of
learners. Most of the respondents seem to agree that problem solving is only possible when
dealing with gifted students and in a classroom reach of Mathematics resources. The social
background of the learners, was also cited more often that pupils are not used to problem
solving and hence tend to resist it in favour of the more traditional approaches.

5.3 Summary findings research question two.

Respondents raised various conceptions about problem solving as a teaching approach. The
conceptions were, classified into three categories for easy analysis, the respondent saw
problem solving as, constructivist teaching method, discovery method and some described
it in terms of Polya’s model. The different views raised, about problem solving as a teaching
approach shows that most of the respondents do not know what it is. However considerable
number of them we only able to state that it is a constructivist teaching approach with no
further elaboration, of the method. Those who described it in terms of Polya are mostly those who received questionnaires in their schools, which shows that they went on to find literature about the method.

5.4 Summary findings question three:

We all learn by experience, and hence the role of experience in the teaching and learning of Mathematics cannot be underestimated. This study took place in the first week of school opening and relief teachers were not yet part of the teaching staff. All of the respondents had experience of more than five years, which implies that they were all in a good position to interpret curriculum materials. Most of them indicated that they frequently or occasionally used problem solving. However, there is little evidence to suggest that experience determines choice of teaching approach. This is so because all the sampled teachers had experience running for more than five years and even those with five to ten years of experience responded in similar manner to those with ten or more years of experience.

However, one cannot completely rule out that experience determines the choice of teaching approach, but according to this study, it is difficult to make such conclusions.

5.5 Summary findings of research question four

The findings from this study have shown that choice of teaching method or teaching approach is not an issue of gender. Variables considered, include, description of problem solving as a teaching approach, challenges faced in the use of problem solving, choice of constructivist teaching approaches and the frequency in which they use problem solving. In all these variable there was no difference in conceptions in terms of gender.
5.6 Problems/ Constraints

In carrying out this study, the researcher encountered the following constraints:

- This Researcher is a practising educator, and hence time was limited to cater for the demand of the profession as well as meeting deadlines for the submission of this project. On the other hand, visiting schools during the weekends could not solve anything because most of the educators were out on weekends. To minimise this constraint, the researcher utilised sporting Fridays to go and hand over questionnaires and conduct interviews as well as district panel meetings for Mathematics educators.

- Lack of financial resources to print questionnaires, visit respondents and travel to Bindura frequently to consult the Supervisor. To overcome this constraint, the supervisor and Researcher agreed that some of the work be sent by mail and then returned timeously. The researcher also utilised panel meetings to issue questionnaires to respondents in one place though it had problems of its own. The major problem of giving respondents questionnaires at such gathering is that they consult each other as they go through the questionnaire. To limit this, the researcher tried to explain to them the importance of the study and need for decisions, which are independently informed.

- Gender imbalances, there were very few female teachers in this district and hence it becomes very difficult to generalise results according to gender. The 11% is too small to make any significance generalisation about effect of gender on teacher perceptions. To overcome this constraint the researcher had to travel long distance to find other female teachers in the field of Mathematics but this proved futile.
Response or respondent related constraint—were the respondent, does not know what problem solving is? To overcome this constraint all questionnaire with no response on problem solving were discarded.

5.7 Conclusions

In this research, the researcher managed to answer the four research questions. The study found out that teacher perceptions are influenced, by either, teacher related or child related challenges. Teacher challenges were axial coded and four main groups’ emerged, low efficacy, time, resources and large class size. Teachers’ argued that problem solving as a teaching approach is not well understood by teachers and hence their reluctance to use it. About 90% of them agree that it is time consuming and not possible to use when dealing with examine oriented class and that problem solving is only possible when dealing with smaller class sizes. All these challenges influence teacher perception in the use of problem solving as a teaching strategy and a closer analysis means that no problem solving activities are going to be taking place in schools in the near future.

Teachers also identified challenges, which they perceived, emanate from learners. These were ability of the learner, social background of learner and attitude of the learners. Most of them seem to agree that problem solving is only possible when dealing with gifted learners and that most of our students are used to the chalkboard and demonstration method. Thus, social background is one of the challenges that teachers say makes it impossible for them to use problem solving.

Teacher raised various conceptions of the problem solving approach, which were, put into three groups for easy analysis. Teachers viewed problem solving as, a constructivist teaching approach, Polya’s model and Discovery method. This clearly shows different views and
opinions in which teachers perceived problem solving as a teaching approach. Most of them were only able to state that it is constructive or discovery without elaborating how it works. These various views raised show that most of the teachers do not know exactly what problem solving is.

This study was able to show that experience is indeed a key determinant of teacher perception in the choice of a teaching approach. Most of the sampled teachers though well experienced, indicated that they frequently or occasionally use problem solving in the teaching and learning of Mathematics. Results from the likert scale showed that they constructivist teaching approaches.

There is no evidence to suggest that gender affect teachers’ perception in the choice of a teaching approach. Variables put to test, to verify this claim showed that responses given by males were similar those given by females. This means that other factors such as motivation could be determining by choice of teaching method and not gender.

The project managed to answer all the four research questions. Teacher perceptions are influenced, by teacher attributes and learner related attributes. However, gender imbalances might impinge on the validity of the results, particularly on answers to question four, which says, “What gender differences exist in teacher perception in the use of problem solving as a teaching strategy at ordinary level?” The sampled number of females was too small to generalise about gender differences in perceptions of the problem solving approach.
5.8 Recommendations

Study revealed that diploma holders were able to described problem solving as a teaching approach more than others with higher qualifications and that means there is a gap in the way teachers are being trained. It recommended that further research be done that looks at the way we train our teachers particularly in universities. Universities are churning out graduates, who are half cooked, and as such, teacher education should emphasise more on methodologies than content. It is also recommended, that all teachers go through teacher training colleges, and that teacher training college have a board that supervises them not just being affiliates of Universities.

Teachers should be in-serviced frequently in the use of problem solving. This can be done, by inviting college or universities lectures occasionally in the district. The subject inspectors should be financed by the government so that the make school visits and make lesson observations and help teachers grow professionally. The in-service should also focus on arming teachers with prerequisite skills that allow them to tackle problem solving in any class whether of mixed ability or slow learners.

Gender policies at district levels should be in place so that each school has equal number of both male and female teachers taking Mathematics up to ordinary level. Incentives, be put in place to allow more female teachers to take mathematics teaching at ordinary level.

Teachers in the study cited lack of time as a barrier, to the use of problem solving as a teaching approach. The study therefore recommends a complete overhaul of the Mathematics curriculum so that it is not only examination driven but should reflect on the
needs of the child. The on-going curriculum review should help revamp the ordinary level syllabus, so that learners can draw meaning from Mathematics learning.

Teachers in this study also cited resources, both material and human as challenges to problem solving as a teaching approach. Therefore, this study recommends that the government put in place measures, which retain Mathematics teachers in the classroom, such as paying Mathematics teachers better salaries the present scale.

There exist a large gap in the way we train our teachers, and as such they is a wide gap that needs to be looked at in the way problem solving as a teaching approach is being implemented in schools. They is a missing link between theory and practice in Zimbabwe, Educators should refocus on this method of teacher trainings. This study therefore proposes that the be more research done particularly on the Zimbabwean context in the use of problem solving

5.9 Summary

The summary of the whole project was given; the conclusions rose pertaining to the findings found. The recommendations were also given in a view of encouraging further research. This research found that experience, teacher and child related factors influence teacher perception on the use of problem solving.
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APPENDIX A

QUESTIONNAIRE FOR TEACHER

This Questionnaire aims to gather information on perceptions of teachers on the use of problem solving as a teaching strategy. The questionnaire seeks to collect data from teachers teaching mathematics up to ordinary level. All the information gathered is going to be used for educational purposes and is confidential and will only be used with the permission of the participants. This is in partial fulfilment of a Masters in Science Degree in Education (MSCEDMT)

Section A Teacher Background Information

1 Gender   Male ☐ Female ☐ tick where applicable

2 Age of respondent

☐ 40 and above

☐ 30 to 39

☐ 20 to 29

3 Your Professional Qualification

☐ Certificate in Education

☐ Diploma in Education

☐ Grad CE

☐ Bachelor of Education

☐ Master of Education/Master of Science Education
Any Other Specify..................................................................................................................

4 How long have you been teaching mathematics at ordinary level?

- [ ] Less than five years
- [ ] Five to ten years
- [ ] Ten to fifteen years
- [ ] More than fifteen years

Section B Survey of Teacher Perception.

Rank the following teaching methods according to preference; encircle your choice

1 most preferred                2 preferred                3 least preferred

6 Lecture Method                     1              2            3

7 Demonstrations Followed by question and answer 1              2            3

8 Discovery Method                   1              2            3
9 How often do you use problem solving in the teaching and learning of Mathematics?

- [ ] Frequently
- [ ] Occasionally
- [ ] Never
- [ ] Rarely

10 Describe what you understand by problem solving as a teaching strategy
......................................................................................................................................................
......................................................................................................................................................
......................................................................................................................................................
......................................................................................................................................................
......................................................................................................................................................
......................................................................................................................................................
......................................................................................................................................................
......................................................................................................................................................

11 Justify or state advantages of using problem solving as a teaching strategy
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......................................................................................................................................................
......................................................................................................................................................
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......................................................................................................................................................
......................................................................................................................................................
......................................................................................................................................................
......................................................................................................................................................

12 Suggest ways of promoting use of problem solving as a teaching strategy in the teaching and learning of Mathematics
......................................................................................................................................................
13 What challenges do you encounter when using problem solving as a teaching strategy?
To what extent do you agree with the following statements?

Strongly Agree 1  Agree 2  Disagree 3 Strongly Disagree 4 (Tick the extent to which you agree)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>14 Problem Solving is the most effective way of teaching Mathematics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Problem Solving is time Consuming</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Problem Solving cannot be used with slow learners</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 Teachers need to in serviced on the use of problem solving as a teaching strategy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 I always use this method but usually unaware that I am using it</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 For problem solving to be effective, it should be integrated with other teaching methods.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 Asking me to use problem solving is a waste of time I have my own teaching strategies which I have seen to be effective</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 I enjoy using problem solving in the teaching and learning of mathematics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 Mathematics is not taught the way it should be in most schools</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23 Teacher’s disposition affect his or her teaching strategy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 Poor showing of Mathematics at Ordinary level is a result of bad teaching methods</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26 Most Teachers do not have understanding of problem solving as a teaching strategy</td>
<td></td>
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</tr>
</tbody>
</table>
APPENDIX B

Interview Schedule for Teachers

1 What is your understanding of problem solving as a teaching strategy.

2 Justify the inclusion of problem solving in the teaching and learning of mathematics.

3 What problems/challenges hinder successful implementation of problem solving in the teaching and learning of mathematics?

4 What strategies do you think should be put in place for successful implementation of problem solving?